SKYWAYS

Air Navy Planes... Photos, Speeds & Specs

Pilot's Report: Jet F7U
page 10

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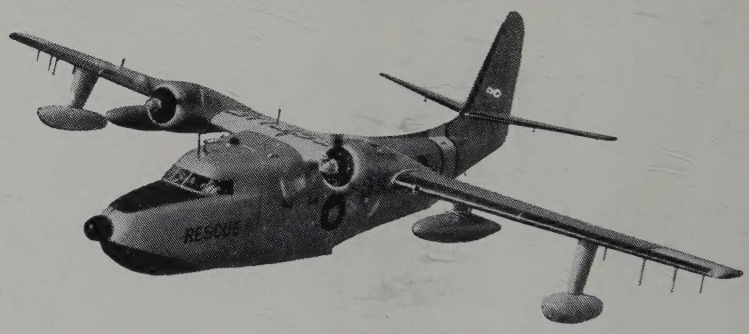
Evolution of Soviet Fighters... page 12

Today, Guardian Angels Fly an ALBATROSS



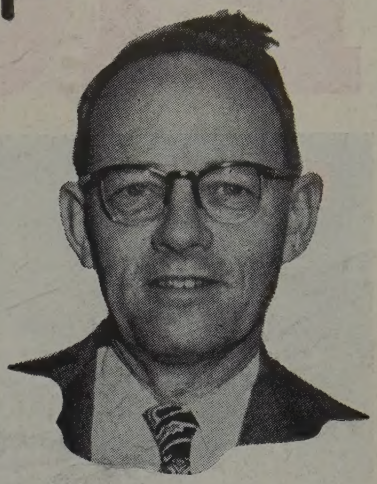
Meet two guardian angels on the wing. Ahead, in the night, lives will be saved. Perhaps the survivors of a capsized sailboat on an inland lake, or a bomber crew downed on a hostile shore, or critically injured seamen on a tanker far at sea. Such are the missions performed in every corner of the globe by Air Rescue Crews of the Air Force. The big amphibian they fly is the versatile and rugged GRUMMAN ALBATROSS.

Originally developed for the Navy, the ALBATROSS is now operated by that service, as well as the Air Force and the Coast Guard.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, LONG ISLAND, NEW YORK

Contractors to the Armed Forces

"Here's Why We Chose the Piper Tri-Pacer"

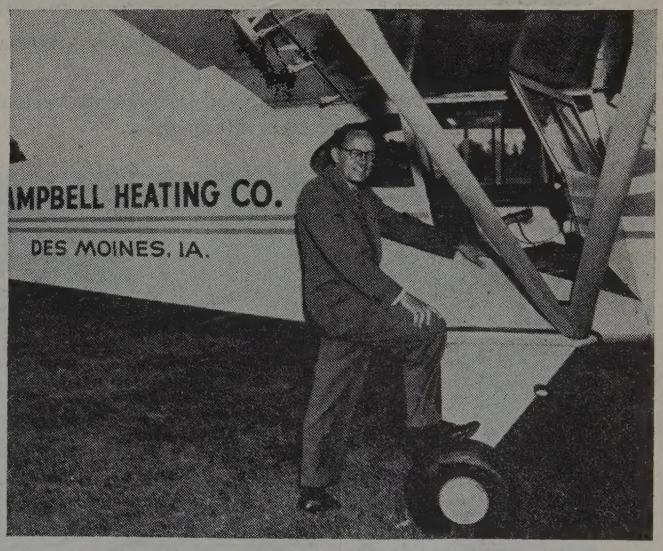


Mr. Bowen Campbell, Pres. Campbell Heating Co., Des Moines, Ia., Manufacturers of heating equipment for large buildings and grain dryers, tells why his firm has bought two Tri-Pacers.

Mr. Bowen Campbell, President of the Campbell Heating Company, Des Moines, Ia., is typical of thousands of business executives who have learned the value of a company plane to step up sales and speed customer service. Mr. Campbell and other company personnel flew their first Piper Tri-Pacer over 50,000 miles in less than a year with such satisfactory results they are now flying their second Tri-Pacer.

Because the Tri-Pacer combines performance, flying ease and utility *with remarkable economy,* the Tri-Pacer is the natural choice of many business executives.

FLYING EASE — "Anybody can fly the Tri-Pacer," says Mr. Campbell shown here with his son Crom who also flies plane for company. "With its tricycle gear and simplified controls, it is ideal for the businessman pilot. And ground handling's so much easier, especially in high winds."



COMFORTABLE TRANSPORTATION — "The Tri-Pacer is ideal transportation. It's quiet, comfortable, gets us where we're going with minimum fatigue. We average better than 120 mph."

UTILITY — "We make service calls as far away as Georgia and Oregon and the speedy service is greatly appreciated by our customers. The Tri-Pacer's big cargo space with the rear seat removed is ideal for handling bulky items such as parts for our heavy industrial burners. All in all, we find the Tri-Pacer an extremely versatile airplane, fast yet economical, easy to fly and reliable."

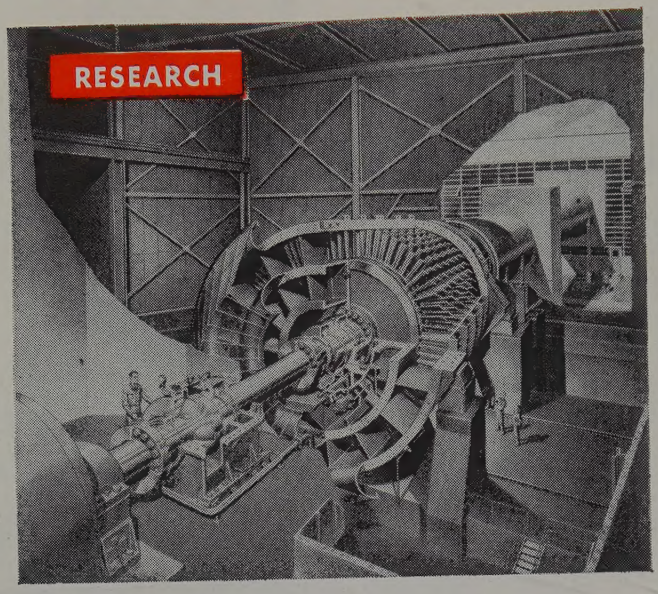
PIPER

is the logical choice for YOU, too,— for Speed, Flying Ease and Lowest Cost

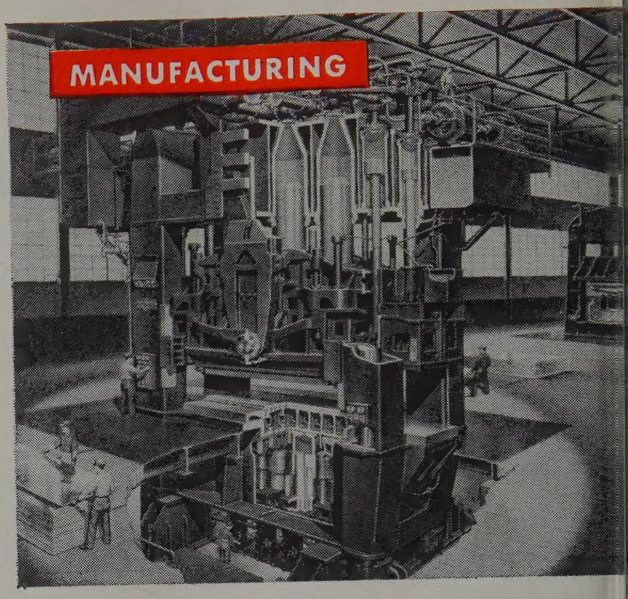
For FREE brochure on new 135 hp Pacer and Tri-Pacer, write* PIPER AIRCRAFT CORP., *Lock Haven, Pa., Dept. 9-K.

Vol. 11, No. 9, September, 1952. SKYWAYS is published monthly by Henry Publishing Co., 444 Madison Ave., New York 22, N. Y. Printed in U.S.A. Subscription Prices: U. S., possessions, Canada and Pan-Am. Union $9.00 for three years, $7.00 for two years, $4.00 for one year; all other countries add $1.50 per year for postage. Six weeks required for address changes (give both old and new address.) Manuscripts, drawings, other material must be accompanied by stamped, self-addressed envelope. SKYWAYS is not responsible for unsolicited materials. Reentered as second-class matter April 16, 1948, at the post office at New York, N. Y. under the act of March 3, 1879.

PICK ANY



World's largest faster-than-sound wind tunnel, NACA, Cleveland, compresses 2,200,000 cubic feet of air per minute to create a 1500-m.p.h. blast. Socony-Vacuum Correct Lubrication protects it throughout.



Birdsboro Hydraulic Press—largest of its kind—exert a force of 8,000 tons to stamp out whole sections o Lockheed Constellations. Correct hydraulic and lubricati ing oils supplied by Socony-Vacuum.

Convair B-36's—world's largest and longest-ranging bombers—have flown 10,000 miles without refueling. Flying Red Horse products played an important part in flight-testing and developing them for the U. S. Air Force.

Twenty-one years of safe operation! That's the ou standing performance record of Colonial Airlines. Acc dent-free record backs up their slogan, "Safety Is N Accident." Colonial relies on Flying Red Horse product

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PACING AIR PROGRESS SINCE

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OF AVIATION...

Flying Red Horse Products are there — Helping Spread America's Wings!

From the ground up—from research and development to actual flight —Socony-Vacuum plays a vital role in pacing aviation progress.

Flying Red Horse products are used in costly flight-testing equipment...in the giant machines used in aircraft manufacture...in the military and civilian planes daily setting new performance and safety records...at progressive airports from coast to coast.

To get the best from your plane use Mobilgas Aircraft, Mobiloil Aero.

Flying Red Horse products, Mobilgas Aircraft and Mobiloil Aero, are sold at hundreds of airports, coast to coast, and border to border.

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AIRCRAFT

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AERO

HISTORY'S FIRST FLIGHT!

SKYWAYS

Cover: Martin P5M

September, 1952

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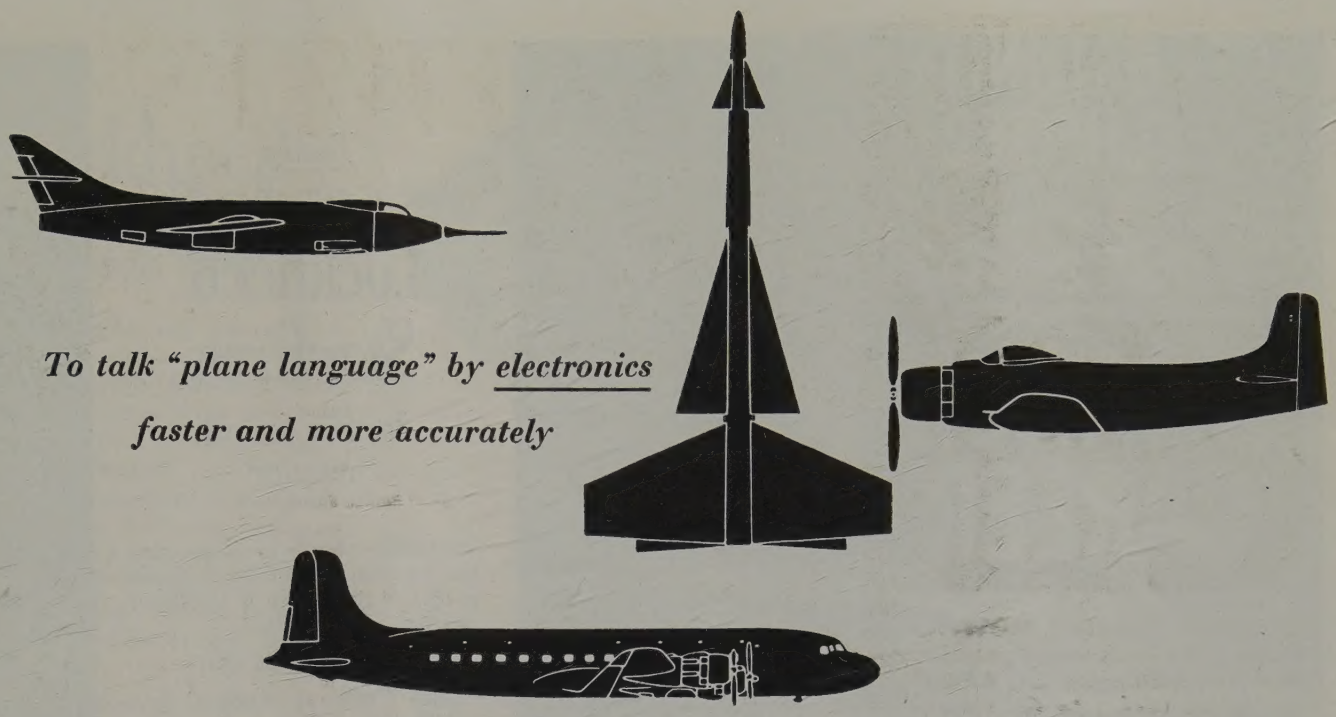


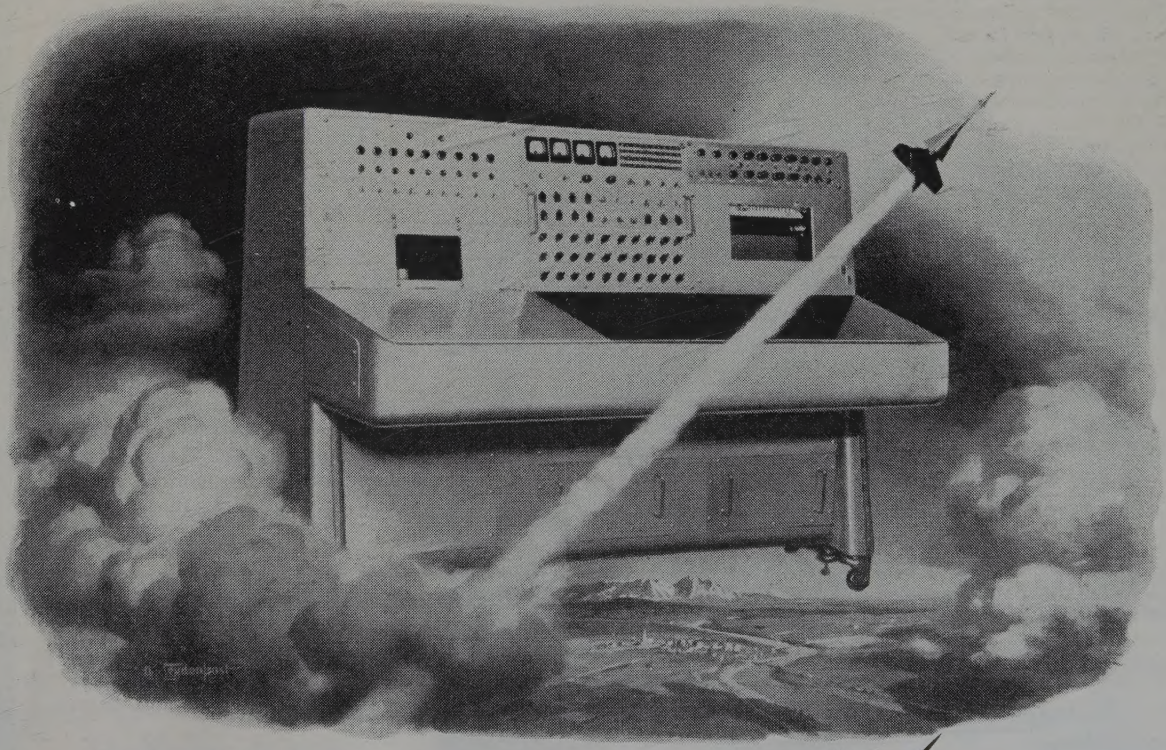
To talk "plane language" by electronics faster and more accurately

—new Douglas Aircraft Computers

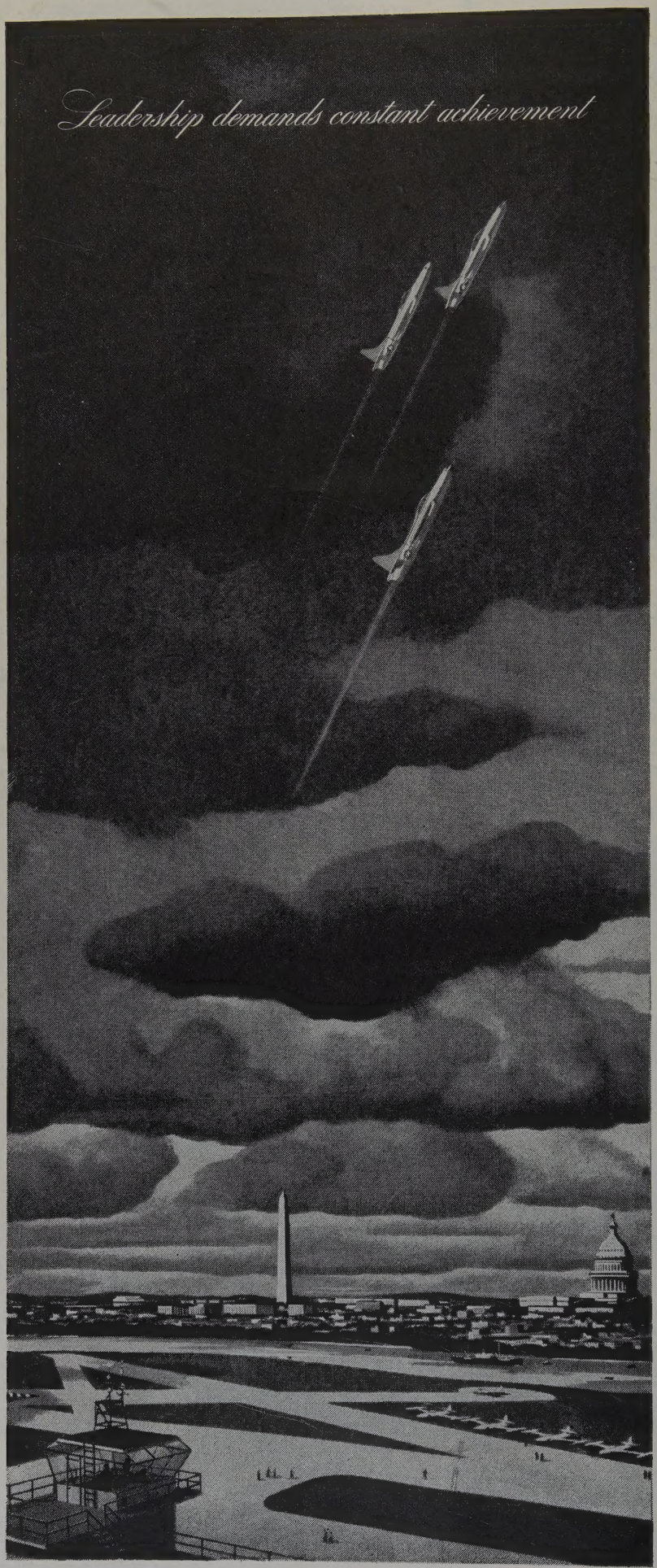
So complex have modern planes become that thousands of hours go into their design. One mathematical problem might take weeks to solve.

To shorten these steps, Douglas has developed automatic computers, analyzers, and measuring devices which work out problems *faster than an engineer can write them down*—codagraphs, iconologs, digital converters. Some take data transmitted electronically, while a plane is in flight, and solve it before the pilot lands—others work with guided missiles. But *all* are designed to simplify engineering problems, and can be used in any industry.

Development of these electronic devices is further proof of Douglas leadership, helps Douglas produce planes in quantity—*to fly further and faster with a bigger payload.*



Depend on *DOUGLAS* **First in Aviation**



Faster
than a cup of coffee

Lockheed Starfires

destroy an air invader

Incredible—but in less time than the few minutes it takes to drink a cup of hot coffee a Lockheed *Starfire* (F-94C) can

Take off from a cold start—

Climb 7 miles up in any weather—

Locate enemy bomber automatically—

Destroy the invader, without ever seeing it.

Furthermore, the 2-man crew need never have seen the bomber they destroyed.

Today these all-weather jet interceptors are being delivered to the U.S. Air Force for 24-hour duty guarding U.S. borders and key cities. It gives the Air Force a fast-climbing jet fighter that is almost automatic—forerunner of planes that may actually fly and fight by themselves.

The *Starfire's* brain center can locate invading bombers on the darkest, stormiest night. Its unique all-rocket armament can destroy the biggest bomber built.

The *Starfire* is another example of Lockheed design "stretch"—an engineering achievement of creating a more advanced model out of an existing airplane. This speeds development and production, also cuts cost. Forerunner of the *Starfire* is the Lockheed F-80 *Shooting Star* of Korean fame. Lockheed is the world's leading builder of jet aircraft.

Lockheed
Aircraft Corporation
Burbank, California, and Marietta, Georgia

Look to Lockheed for Leadership

Lockheed

STARFIRE NEARLY AUTOMATIC FIGHTER

On the opposite page you see illustrated in action the nearly automatic Lockheed *Starfire* (F-94C). This all-weather jet fighter is an electronics masterpiece with an interesting development history.

The "C" is the third in the *Starfire* series and is now being delivered to the U. S. Air Force to augment squadrons of F-94A's and F-94B's now on 24-hour duty as protection for such key cities as New York and Washington.

The evolution of the *Starfire* actually dates from the spring of 1945, when Lockheed developed America's first operational jet fighter, the F-80 *Shooting Star*. From the F-80 came the T-33 two-place jet trainer now used to train 9 out of 10 U. S. jet fighter pilots (also pilots from 9 other nations).

In turn the T-33 was redesigned to incorporate the most advanced electronic equipment known as well as some unknown devices that had to be specially invented. This became the U. S. Air Force's F-94 *Starfire*, now developed to the point where it both flies and fights with more than human accuracy. It has an all-rocket armament—no guns!

Electronics innovations include the Westinghouse Autopilot and Sperry Zero Reader. It is one of the few fighter-type planes equipped with ILS (instrument landing system) for low-visibility landings. *Starfires* pack 1200 pounds of electronics, compared to 168 pounds of radio in the Lockheed P-38 of World War II.

The *Starfire* is the first production aircraft to fly with the new Pratt & Whitney J-48-P-5 jet engine. Its afterburner provides extra power for rapid take-off and extra performance in battle.

The F-94C is the largest of the original Lockheed jet series. The statistics: take-off weight, more than 2000 pounds; length, 41 feet, 5 inches; wingspan, 37 feet, 6 inches; height, 13 feet, 7 inches.

A pioneer in the jet field, Lockheed has produced more jet aircraft than any other manufacturer.

AIR YOUR VIEWS

Helicopter Training

Gentlemen:
After my discharge from the Army in a few months, I plan to attend a helicopter training school to prepare myself for a CAA Commercial Pilot's exam. I would appreciate information regarding such schools now in operation.

R. D. BERRIGAN
APO 301
San Francisco, Calif.

Gentlemen:
At the present time I'm trying to locate a helicopter school. I've spent three years in the Air Force working with rotary-wing aircraft and I'd like to continue that work as a civilian.

JON HESLIN
Port Townsend, Wash.

Here is a list of the CAA-approved schools.

East Coast Aviation Corp.,
Boston (Bedford) Airport
Lexington 73, Mass.

Nashua Aviation & Supply Co., Inc.
Boire Field
Nashua, New Hampshire

Lyons Flying School
Zahn's Airfield
Lindenhurst, N.Y.

New England Helicopter Service
State Airport
Hillsgrove, Rhode Island

Petroleum Bell Helicopter Services
Lafayette Airport
Lafayette, La.

J. D. Reed Co., Inc.
Municipal Airport
Hangar #8
Houston, Texas

Rick Helicopters, Inc.
13440 South Central Ave.
Los Angeles 2, Calif.

H. J. Stevenson
Sky Haven Flying School
RFD #58
Woods Cross, Utah

Westair Flying School
Westchester County Airport
White Plains, N.Y.

E. W. Wiggins Airways, Inc.
Municipal Airport
Norwood, Mass.

Civil Air Patrol

Gentlemen:
We would like to congratulate you for your article "Neighborhood Air Force" by Miriam Lundy. We appreciate the fact that you, through SKYWAYS, have given the Civil Air Patrol the credit it has so long deserved.

A/3C Roger Billett, ex-1st Sgt of Minneapolis Cadet Squadron, and myself, ex-Cadet Capt and Commanding Officer of Minneapolis Cadet Squadron, were very active in the Civil Air Patrol before we enlisted in the Air Force. We are now at Keesler AFB, taking a course in radar maintenance.

A/3C JOHN H. SCHUCK II
A/3C R. H. BILLETT
Biloxi, Miss.

Cadet Candidate

Gentlemen:
I am 17 years old and am thinking about joining the Air Force as a pilot. Could you give me information on what is required to become a pilot in the USAF?

J. MacDOUGALL
Palm City, Calif.

To become a cadet in the Air Force, the candidate must be a citizen of the U.S.; between the ages of 19 and 26; must be of excellent character and able to pass such physical examinations as are prescribed; and must have satisfactorily completed at least one-half of the credits (two years) leading to a degree at a recognized college or university, or be able to pass an examination which measures the equivalent thereof. If, however, you enlist in the Air Force after graduation from high school, you may request cadet training and, after serving as an enlisted man in the AF for a period of time, you may be assigned to your requested cadet training program.—Ed.

Convair . . . or Consolidated

Gentlemen:
In one issue of your magazine you stated the B-36 was built by Convair . . . and in another issue you credit Consolidated. Which is it?

A. GERSHON
Atlanta, Ga.

Both are right. "Convair" is an abbreviated form of "Consolidated Vultee Aircraft."—Ed.

Mach Number

Gentlemen:
I have seen the word "Mach" used in several articles and would like to know what it means.

M. NAHMIAS
Rochester, N.Y.

A Mach number represents the ratio of the velocity of an object to the velocity of sound under the same atmospheric conditions. A speed of Mach 1 means the speed of sound, regardless of altitude (speed of sound is 761 mph at sea level; 660 mph at altitude of 35,000 feet). A speed of Mach .5 means a speed one half the speed of sound for that particular altitude.—Ed.

Douglas Skyknight

Gentlemen:
Some time ago you featured the F3D *Skyknight* on SKYWAYS' cover. The photo showed five white lines painted on the vertical fin. Could you tell me what those markings are?

FRED CAMPHANSEN
San Marcos, Calif.

The white lines are on the underside of the fuselage (tail section) and on the vertical stabilizer to designate to the landing signal officer (LSO) on the aircraft carrier what attitude the plane is in before he gives the landing signals.—Ed.

'Copter Rescue

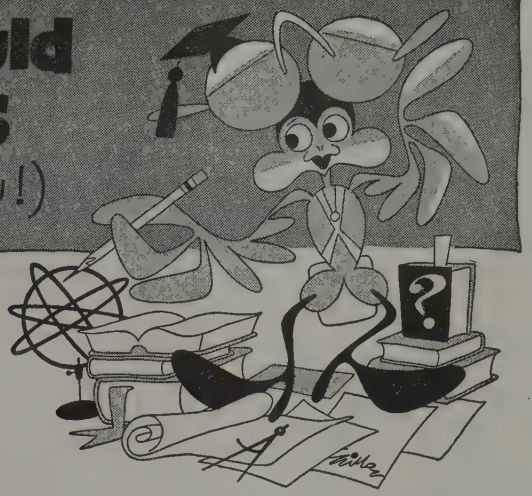
Gentlemen:
No story about the air war in Korea would be complete without mention of the helicopter. Day after day, the 'copters fly in, transporting the seriously ill or wounded from the front lines to the Mobile Surgical Hospital or from MASH to an Evacuation Hospital. These 'copter pilots and mechanics are an unheralded factor in our very low battle casualty death rate.

A. EVART
APO San Francisco, Calif.

CONVAIR WILL SOON MANUFACTURE A TYPE OF MISSILE FOR THE U. S. NAVY BUREAU OF ORDNANCE IN POMONA, CALIFORNIA . . . AMERICA'S FIRST PLANT FOR THE MASS PRODUCTION OF OPERATIONAL GUIDED MISSILES

What every pilot should know about MICRONS

(Psst! What you don't know can hurt you!)



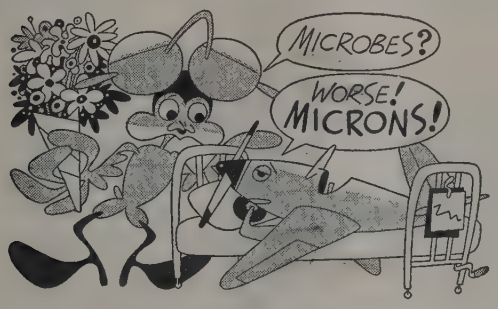
"And what," you ask, "is a *micron*?"

Answer: "Micron" has *two* definitions, and you'll want to know them both—the first to impress your friends, the second to keep out of trouble. Here they are:

1—A micron is a *measurement of length.* Just remember that 25,400 microns equal one inch . . . and then take it from there. From now on, in your hangar-flying sessions, don't just say "mile" when you can say "1,609,344,000 microns." The boys will be amazed.

2—A micron, chemically speaking, is a particle having a diameter of .000039 inch. Engine manufacturers warn that particles larger than 10 microns in diameter can be injurious to your engine. Four particles of this 10-micron size would have to get together before you could even see them with your naked eye, even if your latest CAA physical shows that you have 20-20 vision.

But when these invisible particles get into your engine —watch out! They can cause damage or undue wear. They could even cause engine failure and a forced landing.



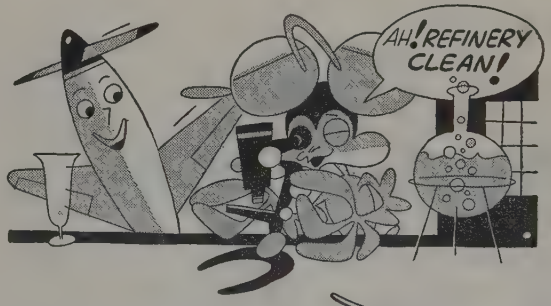
How do they get in?

They get into your engine with the gasoline—regardless of the brand you use. No matter how carefully it's transported from refinery to airport, gasoline can't help picking up airborne dust particles, including sand and rust.

How to trap the little rascals

How can you trap these particles—keep them out of your engine? Not with fine mesh screens. And certainly not with ordinary filters. The *only* solution is to force the gasoline through specially designed filters—just ahead of the gasoline hose—before it goes into your tank.

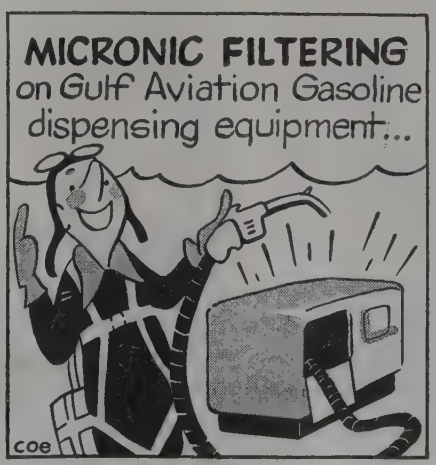
So that's exactly what Gulf is doing for you. Gulf has installed filters on its Aviation Gasoline dispensing equipment, designed to completely remove all particles 10 microns in size or larger. From now on, for the sake of your engine and your own safety, go GULF . . . get gasoline that's *refinery clean.*

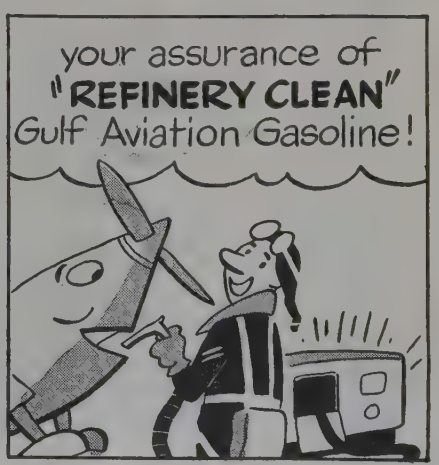


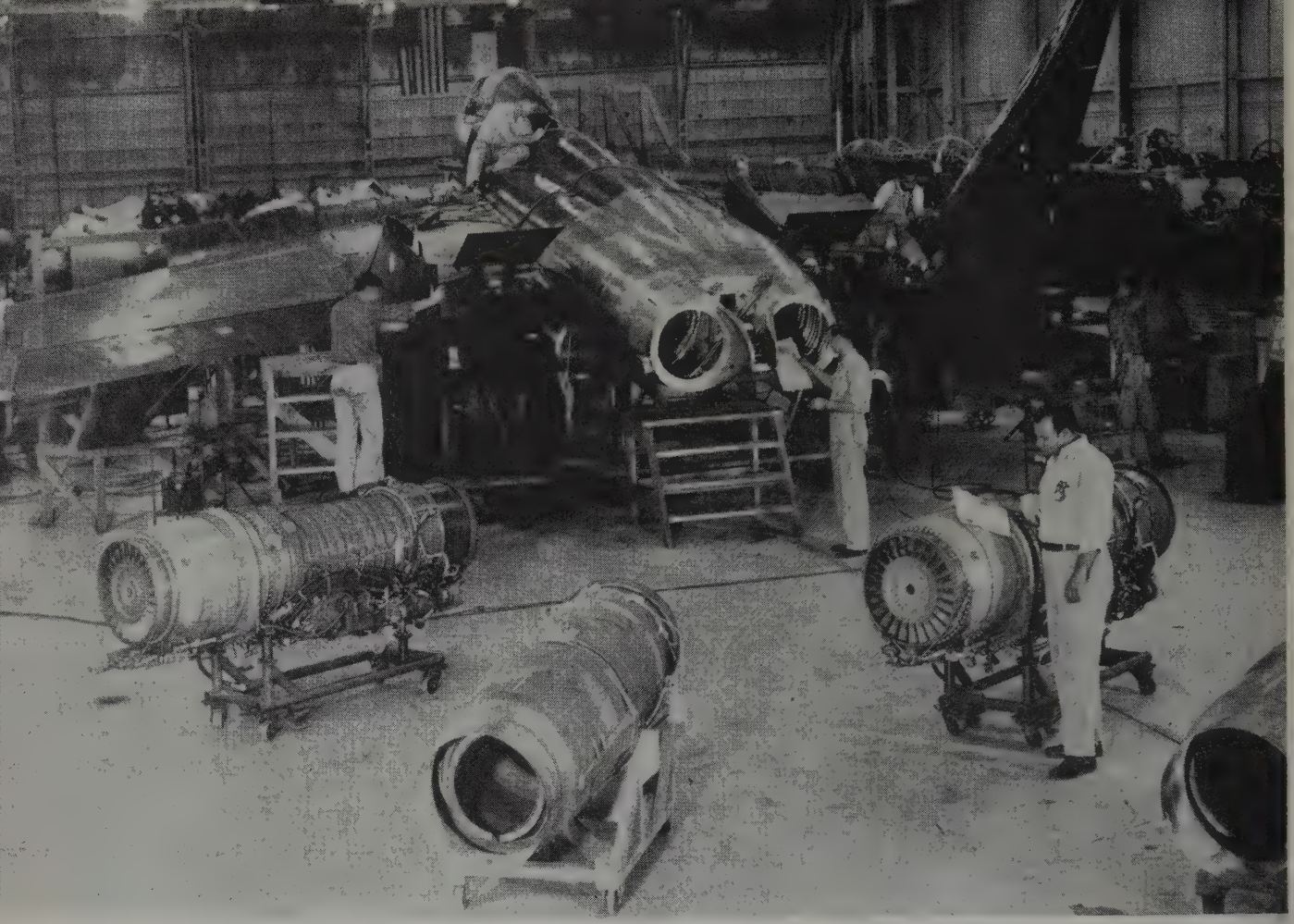
Gulf Oil Corporation . . .

Gulf Refining Company

GULF
AVIATION PRODUCTS





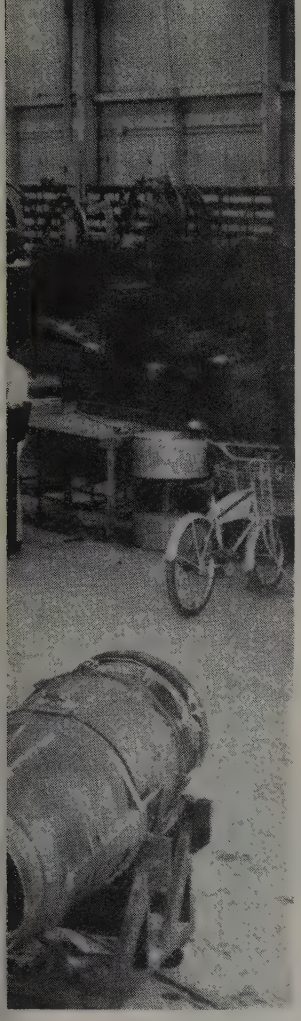


Pilot's Report: F7U CUTLASS

By Boone T. Guyton

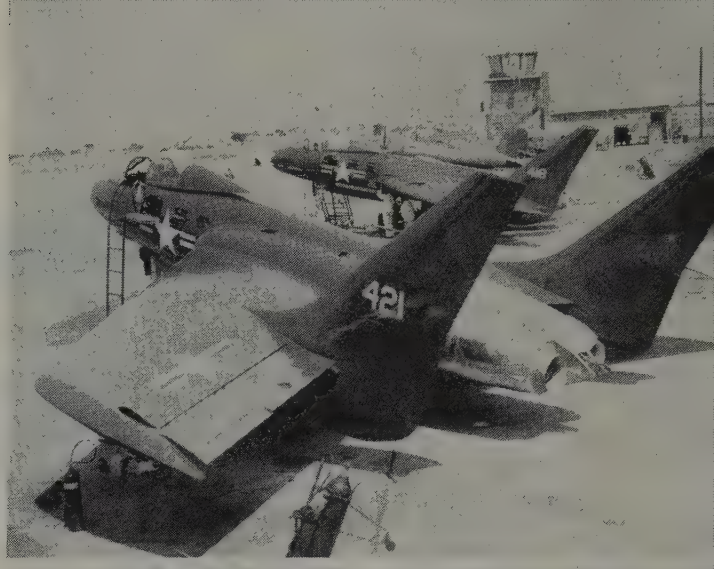
In 1944, along with other test pilots and military pilots attending a fighter conference at NAS, Patuxent River, Maryland, I had an opportunity to fly the first jet fighter in America. This airplane, the Bell P-59, had set the stage for a new era. My flight proved to be a tremendous sensation on the one hand and a disappointment on the other. On taking off, it had seemed so quiet within the cockpit I wondered whether or not the engines were running. Pointers in tremorless dials indicated they were. The flight was like soaring at high speed with an invisible, vibrationless source of power thrusting you forward. My first thought, after relaxing with the knowledge things were going all right, was "no more propellers for me." All other pilots had the same comment. The stillness in the cockpit while surveying the land of men through that clear windshield area was conducive to thinking. This was a sensation of good, clean flight. It was easy to fly this jet airplane and I found a source of real pilot pleasure in the quiet, vibrationless efforts of the engines.

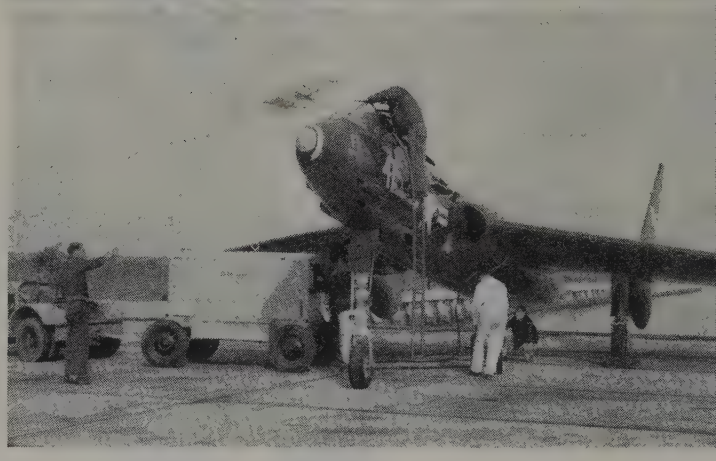
The disappointment resulted from my lack of appreciation of the portent of things to come which this tired old P-59 should have provided. The engines lacked power. With the lack of adequate power the airplane performance was below that of our better prop fighters. I saw the trees and missed the forest. This first jet was pointing the way to the incredible speeds of the *Shooting Stars*, the *Thunderjets*, the *Panthers*, the *Banshees*, the *Cutlasses* of today, but I missed the point. In retrospect, it is immediately obvious that with that first experimental jet fighter, we were embarking upon an era of



FLIGHT LINE—Chance Vought F7U-1's *(right)* are lined up on the flight line preparatory to delivery to the Navy. The F7U is powered by two J-34-WE-32's with afterburners

CUTLASS requires over 25,000 different design parts. In the F7U, there are 1700 pieces of tubing, 40,000 feet of electrical wiring, 5,000 feet of plumbing; all a tight fit





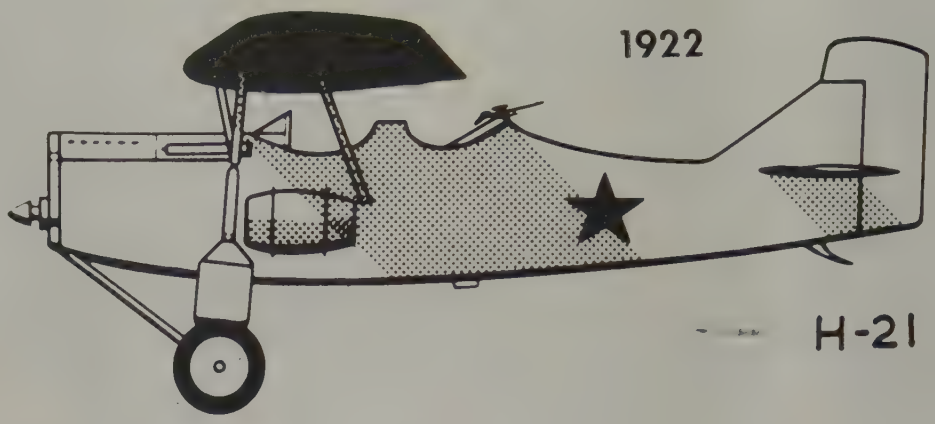
CREWMEN get an F7U ready for flight *(right)*. Cockpit of *Cutlass*, like any other jet, is a mass of controls, instruments, dials, switches, knobs, lights, and selectors

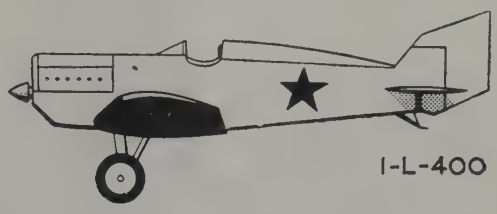
speed and airplane performance undreamed of even as the first bomb fell on Pearl Harbor in 1941.

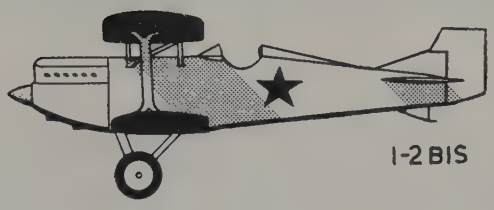
Not long ago, one of the leading military pilots in our country said that there was a great deal of glamourized foolishness written for public consumption about jet airplanes and jet pilots. He is so right. Actually, though we may be slow to admit it, there is nothing mysterious about the modern jet fighter or the pilot who flies it. While the airplane marks a singular advance in airplane performance, the pilot simply learns to adjust his flight habits to agree with such changes as higher altitudes, higher speeds, higher fuel consumption, etc. He still flies with a stick and rudder. Despite the tremendous speeds attainable—500, 600, 700 mph—the sweptwing, single-seat jet fighter is easier to fly than the old prop-driven airplane of the days of Truk and Rabaul. Furthermore, it is more comfortable and has several safety gadgets and household appliance items that were not available in the old propeller job. But, with no firm figures quoted, you may be certain the complexities involved in designing and building the jet fighter have quadrupled.

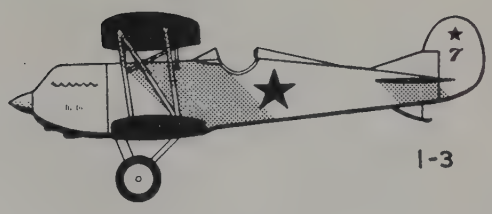
In considering what goes into one of these jet airplanes you will at once understand why such an airplane is a series of intelligent compromises. The F7U-1 *Cutlass* is representative of the quality modern jet fighter of today, though you could choose a *Panther*, a *Thunderjet*, a *Sabre*, a *Skynight*, or a host of others and draw a similar conclusion. The *Cutlass* is a low aspect ratio (engineering English for stubby wings), single-seat Navy fighter with rakish looking sweptback wings. Its most distinguishing feature, paradoxically, is that it does not have a tail. After serious thought and long, searching study, the tail was omitted so it could not buffet and shake as the airstream separated from the wing at high velocities to let the turbulent wake strike the tail section when the airplane neared the speed of sound.

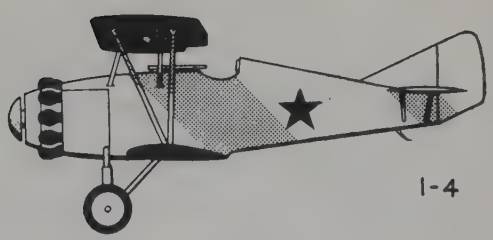
Fully loaded for combat, the *Cutlass* can take off and land on the deck of an aircraft carrier, fly in level flight at speeds in excess of 600 mph, operate from sea level to some 10 miles high (about 50,000 feet), give out and absorb a whale of a lot of punishment, and show little concern for the touted "sonic wall." The range of the airplane, like that of most modern jets, is comparable to the prop fighter. It simply goes higher and faster to do it. The *Cutlass* has two axial-flow jet engines and was the first airplane in the world designed from the outset to include afterburners for more power when special timely bursts of additional speed are needed. The afterburner is a (*Continued on page 40*)

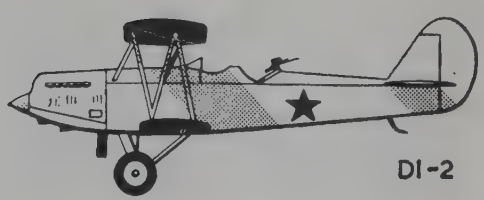










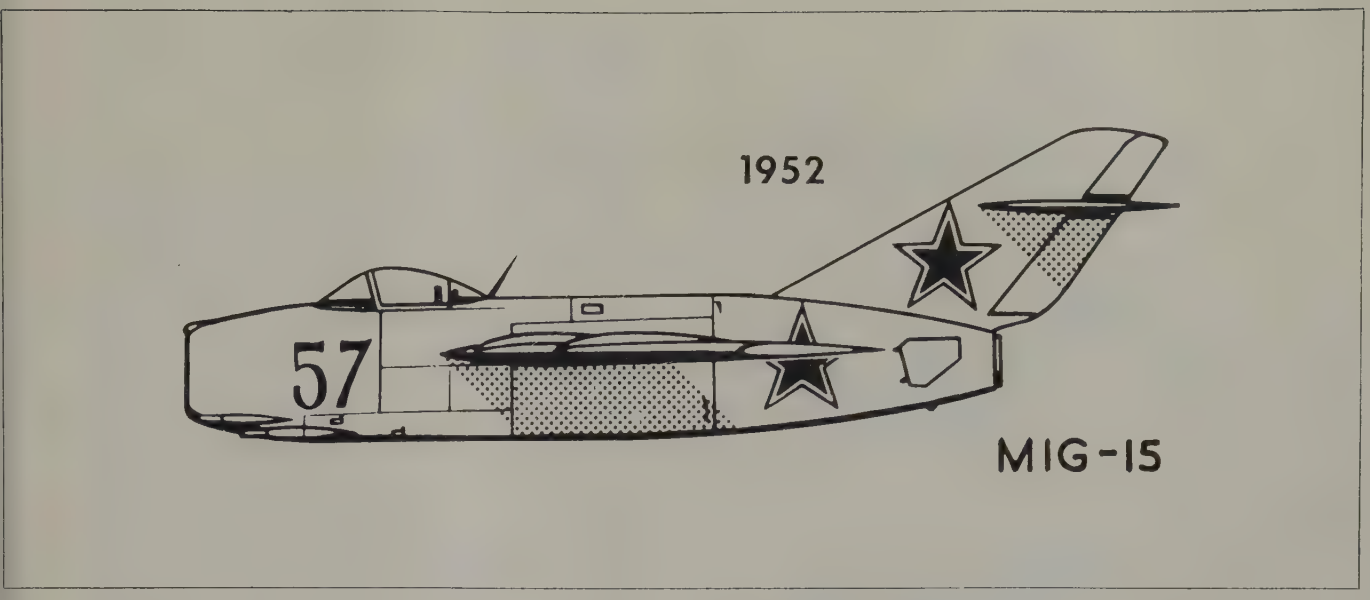


Evolution

By WILLIAM GREEN

It has been said that the Soviet Union's security curtain constitutes one of her major weapons of defense. This being so, and particularly at the present time when Russia's actions can only be regarded by the West as signs of aggressive intent, any attempt to trace the design development of Soviet combat airplanes is of far more than academic interest. The Russians can no longer be regarded as a race of illiterate peasants. They have a natural attraction towards things mechanical. They are good at imitation, yet inventive, and these facts are no better illustrated than in the history of the Soviet airplane industry.

It is not only in recent years that the Soviet Union had been unwilling to divulge her prowess in aviation; the size and technical development of Soviet air power has been something of an enigma outside Russia since the days of the October Revolution. But whereas this reluctance to divulge information on national aviation development was, in prewar years, considered to imply a backwardness in technical standard and a wish to hide Russia's shortcomings, since the end of World War II, Soviet secrecy has betokened a far more significant state of affairs; one that only impressed itself upon the Western world with the unexpected debut of the



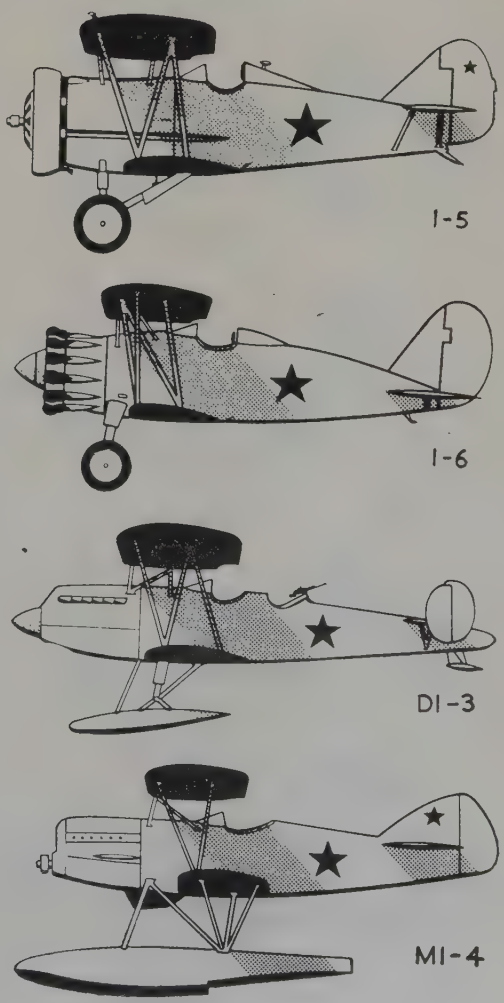
# of Soviet Fighters

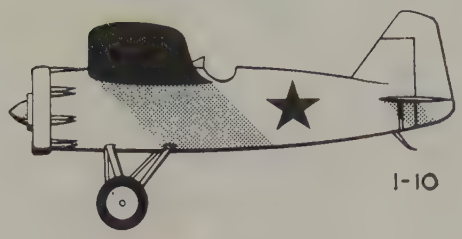
MiG-15 fighter in the combat skies over Korea.

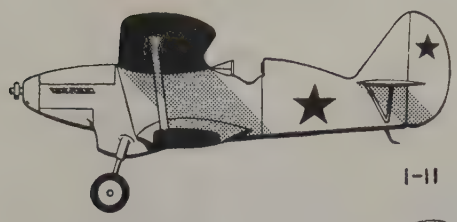
Today, Soviet fighters are comparable in quality and superior in quantity to the best that the West can put into the air, yet, but a decade ago, Russia's fighters were technically many years behind those of the U.S., Britain, and Germany. It has been said that this change in the picture is due to technical know-how acquired from Germany after the war, but it cannot be explained away quite so simply as that. The gradual evolution of the Soviet fighter as a class is also the evolution of the Soviet aircraft industry as a whole, and it is only now possible to piece together the puzzle of this process of evolution that has taken 30 years. The story, as presented here, is, of necessity, still incomplete, but it does portray the background of the most important airplane type in Russian service—the fighter.

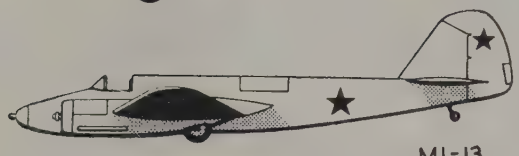
During the First World War, the Russian aircraft industry was quite firmly established, but from 1916, when 1,769 airframes and 660 engines were built, the industry gradually declined until, in 1920, not a single airframe or engine was completed. The early years of the revolution had brought chaos to the aircraft industry; many of Russia's aircraft designers and engineers were liquidated or succeeded in escaping from Russia, and the workers in the airframe and engine plants looted the tools before leaving the towns for country areas in search of food.

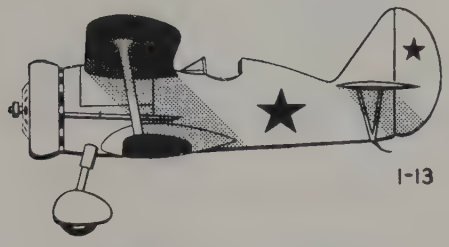
It was not until 1922-23 that airplane construction in Russia again got under way. The policy of

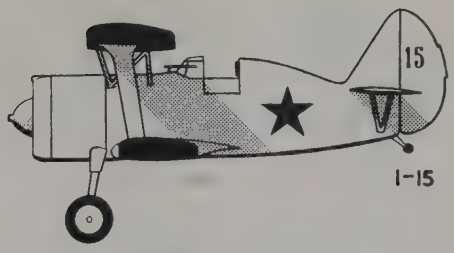


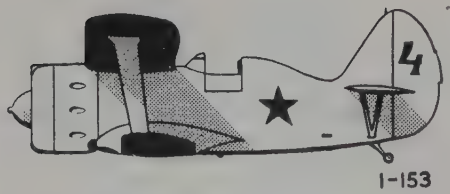


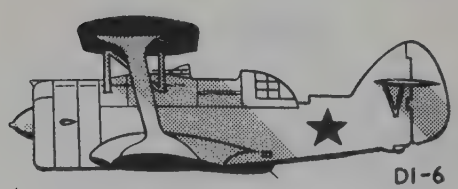












the early years was inevitable. Imperial Russia produced no successful fighter designs during World War I, and the fighter elements of the newly formed Soviet air arm had to content themselves with a miscellany of French Nieuports and Spads, and British Sopwiths that had been taken over from the Imperial Russian Air Force, until British Martinsyde F.4 and Italian Ansaldo fighters could be acquired from war surplus stocks. Next, the Soviet Government invited foreign airplane manufacturers to establish plants in Russia and thus provide a nucleus for the new Soviet aircraft industry.

The Junkers concern founded the first modern airplane manufacturing plant at Fili, near Moscow, and built various designs, including Russia's first fighter, the H-21, a two-seat parasol monoplane of typical Junkers conception and powered by a 185-hp BMW engine. Unfortunately, the H-21 suffered serious teething troubles and after the crash of the prototypes, the government appropriated the plant and installed Hugo Junkers' pupil, Andrei N. Tupolev, as chief designer.

Apart from Tupolev, Russia possessed few engineers capable of original design, but by 1924 airplane development had begun to gain momentum and gradually the foreign influence was absorbed in native designs. In that year, Dimitri P. Grigorovich had begun work on the first nationally designed single-seat fighter, a thoroughly orthodox single-bay biplane with a cross-axle Vee-type undercarriage and a 400-hp M-5 (license-built *Liberty*) engine. Known as the I-2 and, in slightly modified form, as the I-2B ("I" denoting its function of single-seat fighter—*Istrebitel*), it had a wooden structure and its performance by world standards of that time left much to be desired. Nevertheless, both I-2 and I-2B were placed in limited production in 1928, and their armament consisted of two 7.62-mm DA-type machine guns designed by V. A. Dyegtyaryev—the first machine gun of Soviet design.

Nikolai N. Polikarpov, Grigorovich's pupil, also designed a fighter at about this time, the I-L-400 which was test flown in 1925. His ideas on fighter design were less orthodox than those of Grigorovich, the I-L-400 being a low-wing monoplane of composite construction. Although of advanced design, this airplane did not possess the maneuverability of its biplane contemporary and this factor, together with production complications, led to its abandonment.

Although in any country more prolific in airplane designers, Grigorovich's reputation on the score of his I-2 fighter would have been unenviable, the decision to manufacture his next single-seat fighter, the I-3, established him at the head of Soviet combat-airplane designers. The I-3 was, in actual fact, a re-hashed I-2B, using the more powerful 550-hp M-17 (license-built BMW-VI) which brought the

top speed of the I-3 up to about 174 mph.

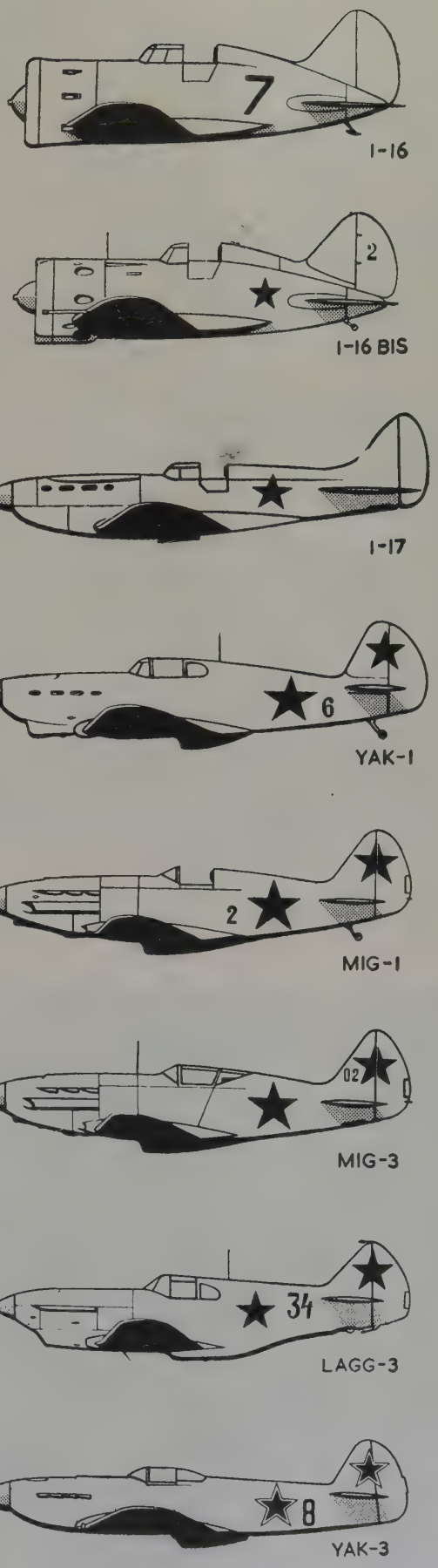
Andrei Tupolev, who had been building all-metal bombers to Junkers designs at the Fili plant, was convinced that fighters should also be of metal construction. With the aid of P. O. Sukhoi and Vladimir Petlyakov, Tupolev produced the I-4, a single-bay unequal-span biplane of metal construction throughout and powered by a 480-hp M-22 (license-built Gnome-Rhone) radial. The I-4 proved itself considerably superior in combat qualities to the I-2B and I-3 but its construction called for quantity use of *koltchougalumin* (A Russian substitute for aluminum) which was in limited supply and required for other purposes, and thus, Tupolev's first and (to date) last single-seat fighter was discarded.

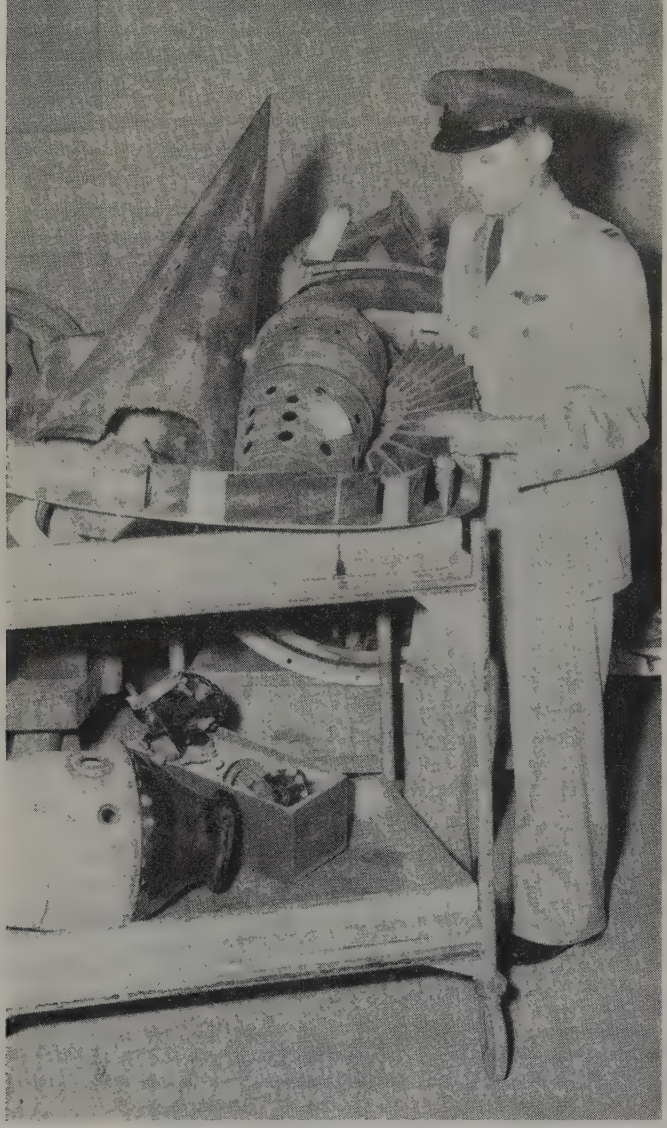
By 1929 Polikarpov had drawn ahead of his old teacher, Grigorovich, in official favor, his success being largely due to his R-5 reconnaissance biplane which he also developed as a two-seat fighter in which form it was known as the DI-2 ("DI" indicating its function—*Dvukhmestny Istrebitel*). This success was furthered by the appearance in 1930 of his I-5 single-seater which set the pattern of development for Soviet single-seat fighters for some years to come. A stubby little single-seater, reminiscent of Britain's Bristol *Bulldog*, the I-5 was comparable with its Western contemporaries and was the first Soviet fighter to be awarded really large production contracts. Powered by a 480-hp M-22 radial, its top speed of 173 mph was unspectacular but its qualities of maneuver were unsurpassed and it possessed, what was for that time, the unprecedented armament of four 7.62-mm machine guns firing through the prop.

Grigorovich came up with a new fighter shortly afterwards, the I-6 powered by a 525-hp M-15 radial which gave it a top speed of 208 mph at 15,000 feet. It was, in fact, the first Russian service airplane to exceed 200 mph in level flight. Both the I-5 and I-6 had wooden structures and, together, formed the bulk of Soviet fighter equipment of the early '30's, many remaining in service until 1935-36. Grigorovich also produced the less successful DI-3 two-seat fighter biplane which was unusual in having twin fins and rudders.

During the following years various prototypes appeared, but few progressed further than prototype stage. In 1923 Grigorovich designed the heavily armed "Zet" fighter which, in 1934, was developed into the "destroyer" IP-1, the most outstanding feature of which was its armament of two 20-mm cannon and four 7.62-mm machine guns. Unfortunately, the IP-1 was extremely unwieldy in the air and, despite its remarkably advanced armament, it was dropped.

The I-7 was a landplane version of the MI-4 twin-float fighter seaplane ("MI" indicating marine fighter—*Morskov* (*Continued on page 42*)





Air Tech Intelligence

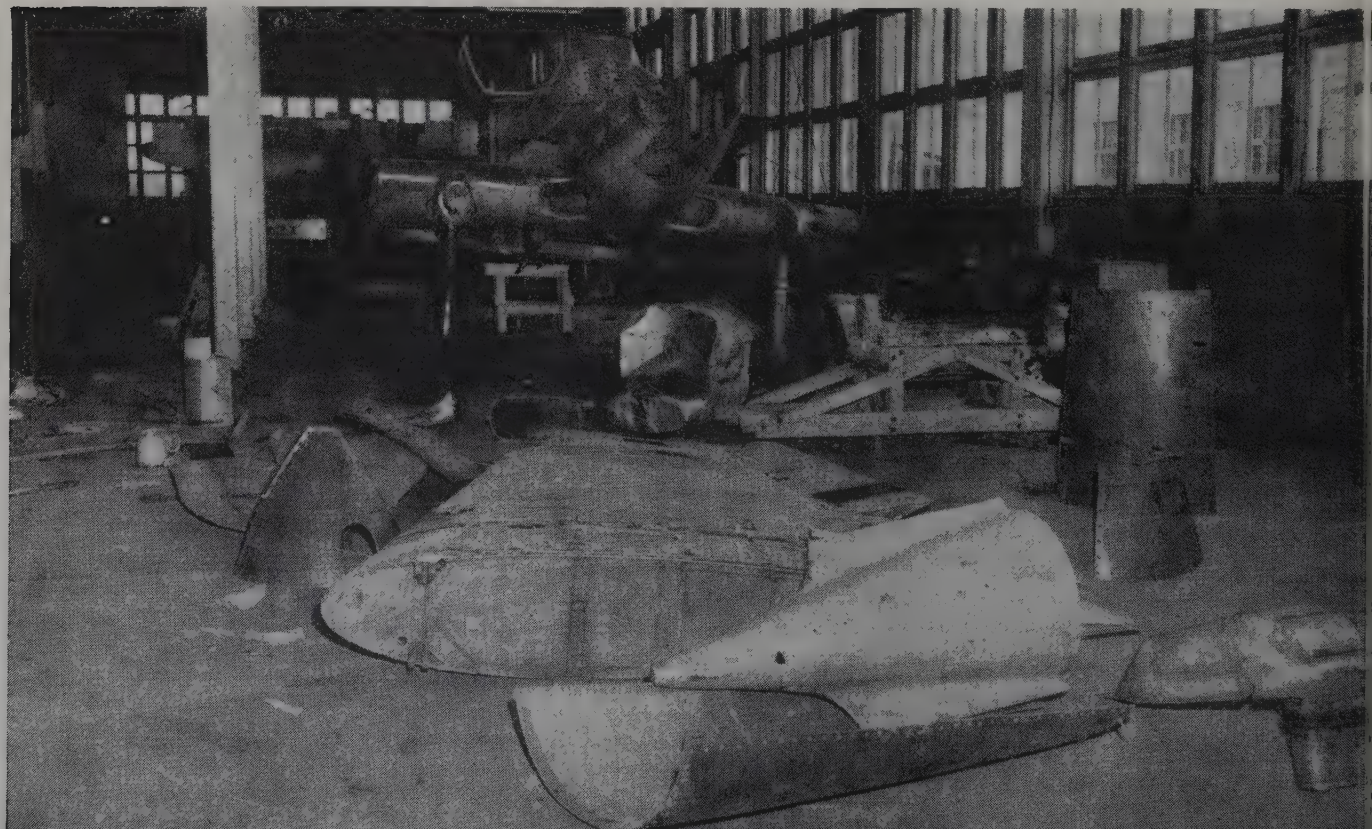
Wright Field flies Russian aircraft; where they come from is top secret

By Douglas J. Ingells

One day, when things were pretty hot along MiG Alley in Korea, the citizens of Dayton, Ohio—almost 10 thousand miles away—got a jolting scare from the heavens.

Civil Defense Director Col. Dick Magee had just come out of his office after a lecture on preparedness against an atomic attack when he heard a strange droning noise in the sky. It was different than the motors most Daytonians were used to; planes from nearby Wright Field. This one had a sound all its own. The plane roared low over the

AIR TECH officer *(above)* studies a pile of what looks like junk. Actually, the pieces are parts of a Russian MiG-15. In another storeroom at WPAFB *(below)* are bits of Russian IL-10. From these parts will be built an IL-10



city, disappeared to the west. Then it flipped over, came back over the heart of the business district again, and headed toward Wright Field.

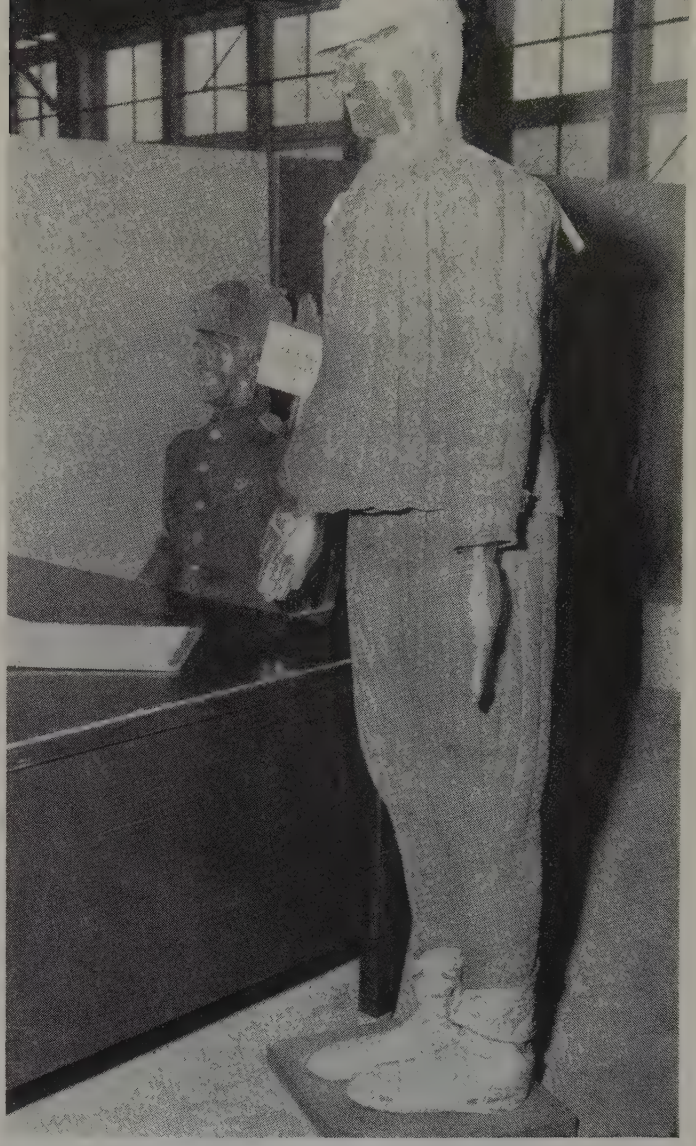
Magee recognized it. The ship wasn't one of ours. It was a Russian YAK fighter. There were red star insignia on its wings!

Others spotted it, too. Radio station and newspaper switchboards lit up like pin-ball machines. Was there a Russian plane over Dayton? Did this mean an attack? Where did the enemy plane come from? People wanted to know. There was no panic. But, admittedly, there was a little mystery.

Authorities at Wright Field soon cleared it up. One of their test pilots, Dick Johnson, was up in a YAK fighter plane running some tests. It was a plane which Air Technical Intelligence experts had "picked up." It had been sent to Dayton for evaluation and study. They had done the same thing with captured German and Jap equipment during World War II. There was nothing to be alarmed about.

Indeed, a vitally important phase of modern air war—technical intelligence—is being fought and won by a carefully screened, selected group of officers and civilians in a closely guarded, fenced-in laboratory at Wright Field.

What goes on here is so secret that the workers themselves can't get into the restricted area without special code numbers on their passes. Even then, an electric "code verifier" flashes like a metal detector in a prison ante room, as each of the workers checks in or out. You can't walk 10 feet inside the area without an escort. Armed guards will stop you.



NORTH KOREAN uniform is displayed here *(above)* on a dummy. Enemy clothing is closely studied for clues to new items of equipment. Gun *(below)* from a MiG-15 also gets a very detailed going over by the Air Tech men

The reason for all of this precaution is simple enough—the secrets they are studying here are not ours! They are the enemy's. *And the biggest secret of all is how much we know about his secrets that he doesn't know we know!*

In this super-secret laboratory—The USAF Air Technical Intelligence Center—engineers, photo interpreters, metallurgists, scientists and specially trained evaluation experts are putting the enemy under a microscope 24 hours a day. What they learn is compiled into voluminous reports which go to our strategic and tactical planners, to our combat commanders in the field, and to industry. It can well become the Bible for a new kind of a fighter plane or bomber that has this or that improvement which will defeat a Red plane in battle. Pilots who have to fight MiG's and other Red planes in the skies on any front are being supplied with "inside dope" about their opponents. That, alone, could be a war-winning secret.

"Simply put," one officer remarked, "we are peeking up Stalin's sleeve at his airpower!"

How they creep up on Old Whiskers and glance at his airpower scrapbook and blueprints, a good ATI man would rather die first than tell you. Some of them have. But it is generally known that ATI's are everywhere. And their prime job is to get every bit of technical information available to our fighting flyers, to air researchers and to industry.

That accounts for the more than 100 tons of captured North Korean and Russian equipment that has been shipped thousands of miles from the fighting zone to ATIC at the big Wright-Patterson Air Force Base. Some of it was flown here, a lot more came by ship. It is here today because ATI teams thought nothing of risking their lives to get it.

That YAK fighter plane, for instance, wasn't ferried over and handed to us on any silver platter. Yet, we got it from behind the Iron Curtain.

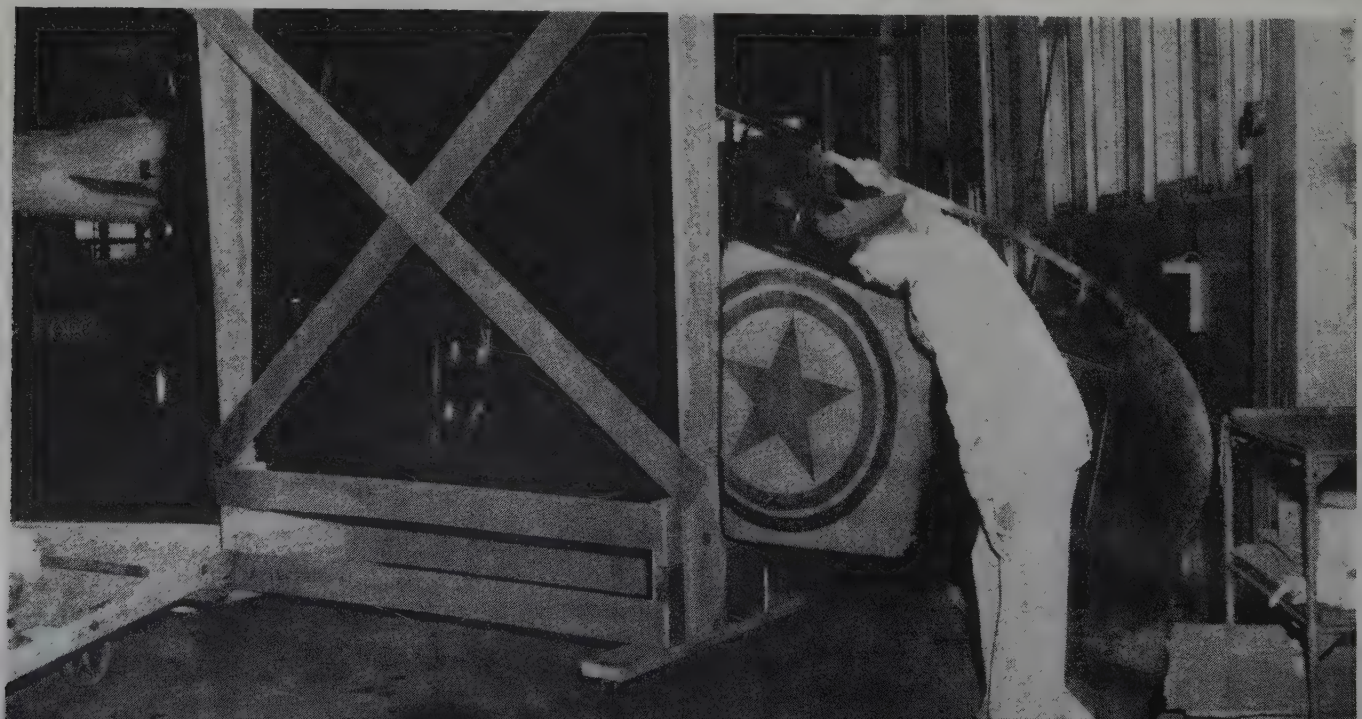
There's one story that a Russian pilot, fed up with Communistic way of life, stole the plane from his squadron, flew it over the boundaries and landed at an American airfield in the Western Zone. He just turned it over intact. Another version is that an American GI on a special mission stole the plane and flew it home. There's a third rumor that infantrymen advancing with Patton's army in the closing days of the war found the ship in a field where it had been forced down. We got to it before the Russians did. No one in ATIC will verify any of these accounts. "The important thing," a Colonel told me, "is that we got the airplane in flyable condition. When we get through with it, the reports will tell us a lot about Russian manufacturing techniques, types of metals, fuels, fabrication methods and actual aircraft performance."

That's an important clue as to why we spend time investigating a YAK fighter, a crate that is a has-been, when our real worry is Russian-made jets over the Alley. The truth is we learned some manufacturing techniques from the YAK that are still being employed in making MiG's!

Incidentally, part of the story about how ATIC got a MiG-15 and brought it back to the center for evaluation has been officially released. It is typical of how ATI teams work in combat.

Imagine a hot air battle just off the coast of Korea—Russian-made MiG's (Chinese Red pilots) battling against U.N. *Sabres*. Suddenly, one of the MiG-15's is hit. It (*Continued on page 53*)

CAPTURED EQUIPMENT, in this case *(below)* a wing from a Russian fighter plane, will be put under a scientific microscope. From pieces of aircraft rather than whole flyable planes, Air Tech learns most about Red equipment



U.S. Air Navy

Special Section

The Navy has not been willing to settle for a short-term combat readiness, limited in nature as the Korean war is limited in scope. In facing the demands of the current fighting, we have not turned our backs on our ultimate goal of long-term combat readiness for general war, if that be thrust upon us.

All naval aircraft procurement programs since Korea have had a twofold purpose—modernization of our fleet air arm and broadening the industrial base.

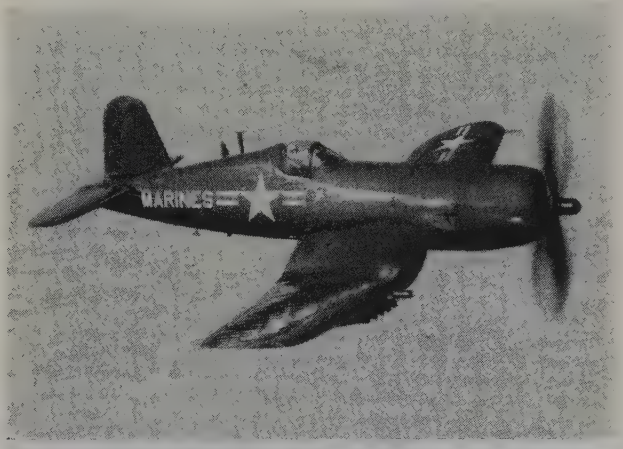
We have balanced the current need for increased production against the long-term need for higher performance and we are now flight testing or about to flight test a number of vastly improved models of jet fighters, attack planes, both large and small, special anti-submarine aircraft, helicopters and guided missiles.

Future years will find the Navy pushing ahead to achieve the best in equipment and the ultimate in operating skills and techniques—to insure that our sea-air power shall be second to none.

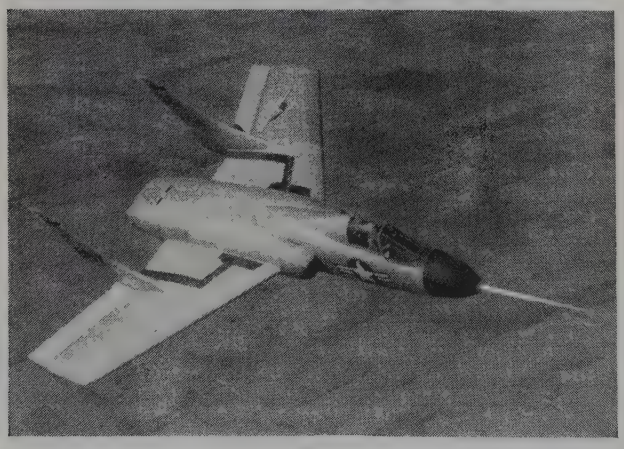
Rear Admiral Wm. D. Clarks
Chief, BuAer, USN

Fighters

CHANCE VOUGHT F4U-5N is one of six versions of the famed *Corsair*. A carrier-based night fighter-bomber, the F4U-5N is powered by a 2300-hp Pratt & Whitney R-2800-32W engine. It has a speed in excess of 350 mph, a service ceiling above 40,000 feet and a rate of climb of 4800 fpm. It is armed with four 20-mm cannon, two in each outer wing. Special radar night-fighting equipment is carried.

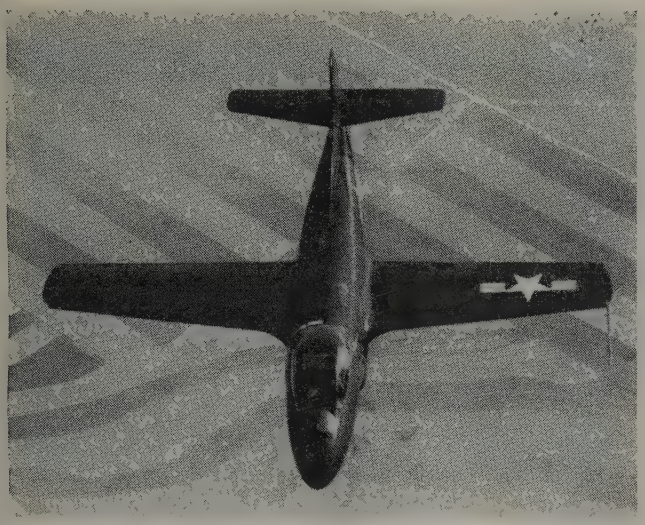


CHANCE VOUGHT AU-1 was originally designated F4U-6. It differs little in outward appearance from the F4U-5, but is powered by a single-stage Pratt & Whitney R-2800-83WA engine instead of the R-2800-32W. The AU-1 is primarily intended for close ground support of troops. It has a speed over 650 mph, a wing span of 41 feet, is 34 feet 1 inch in length and sits 14 feet 10 inches high. Performance figures and detailed armament data on the AU-1 are restricted.



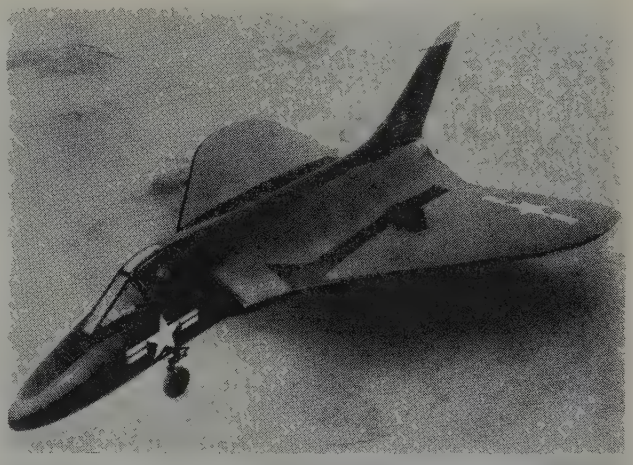
CHANCE VOUGHT F7U-3 is a twin-jet fighter designed to out-fly and out-fight any other carrier-based plane in the world. The first swept-back-wing, tailless fighter to operate from a carrier, the *Cutlass* has a top speed in excess of 650 mph and a service ceiling of more than 45,000 feet. Unofficial reports indicate the Air Force is interested in buying some F7U's for ground-support missions. Performance details and specs are classified, but we know F7U-3 has greater range than the F7U-1.

DOUGLAS AD is the popular *Skyraider* that is daily striking the Commie forces in Korea in support of U.N. ground forces. The *Skyraider* is a carrier-based plane designated "multi-purpose" for the variety of missions it is capable of accomplishing. Powered by a 3,150-hp Wright R-3350 engine, it has a speed of more than 325 mph and carries an 8,000-pound load of munitions. The *Skyraider* pictured here mounts 12 five-inch rockets, two 1,000-pound "Tiny Tim" rockets and a 2,000-pound aerial torpedo. The AD has a wing span of 50 feet and is 38 feet 10 inches long.



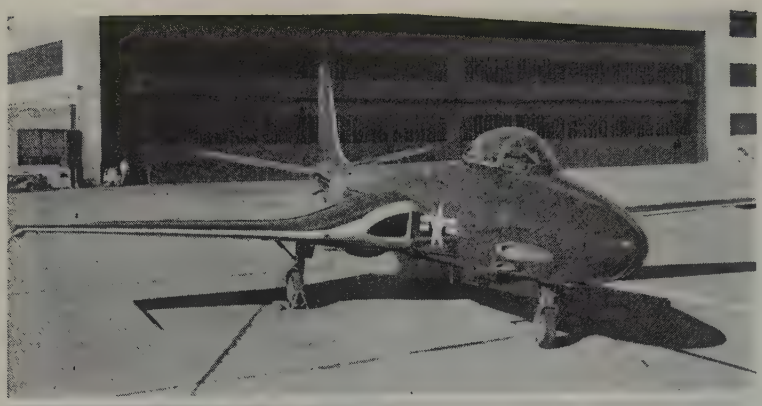
DOUGLAS F3D is an all-weather jet fighter powered by two Westinghouse J-34 engines of 3,250 pounds thrust each. Designed for carrier operations, it carries a crew of two. It has a speed of more than 600 mph. A novel escape chute or slide opens on the underside of the *Skyknight's* fuselage to permit the two-man crew to bail out safely at high speeds without danger of striking the tail surfaces. Special speed brakes extend outward from the fuselage just forward of the tail. Operated hydraulically, they slow the fighter in combat maneuvering and in highspeed dives. Performance data, specifications are restricted.

DOUGLAS F4D was designed for catapult take-offs from carriers and fast climb to the upper atmosphere. Called the *Skyray*, it is powered by a Westinghouse jet engine and has a speed in excess of 650 mph. It has a service ceiling of more than 45,000 feet. An interceptor, the *Skyray* has a swept-wing with a web-like planform and a slender nose extending forward to provide a cockpit. It has no tail. Unique wing permits high and low-speed operation. All performance details are restricted.



GRUMMAN F9F-5 is a single-seater fighter powered by a Pratt & Whitney J-48 jet engine of 6,250 pounds thrust. It has a speed of more than 600 mph and a service ceiling above 40,000 feet. It carries four 20-mm cannon mounted in the nose and can carry externally mounted five-inch rockets, Napalm bombs, etc. Called *Panther*, it has a wing span of 38 feet, is 39 feet long and sits 16 feet 9 inches high. A photo reconnaissance version with a new type camera installation is designated F9F-5P.

GRUMMAN F9F-6 is the latest of a long line of Navy fighters designed and built by Grumman. Called *Cougar*, it is a sweptwing version of the *Panther* and is powered by a Pratt & Whitney J-48 jet engine. It has a speed in excess of 650 mph and has a service ceiling of more than 45,000 feet. It probably carries the same armament as the *Panther*. In production at Grumman's Bethpage, L. I. plant, the *Cougar* is the successor to the battle-proved *Panther*, the first jet plane to be used in combat by the U.S. Navy. No performance details, specifications are available at this time.



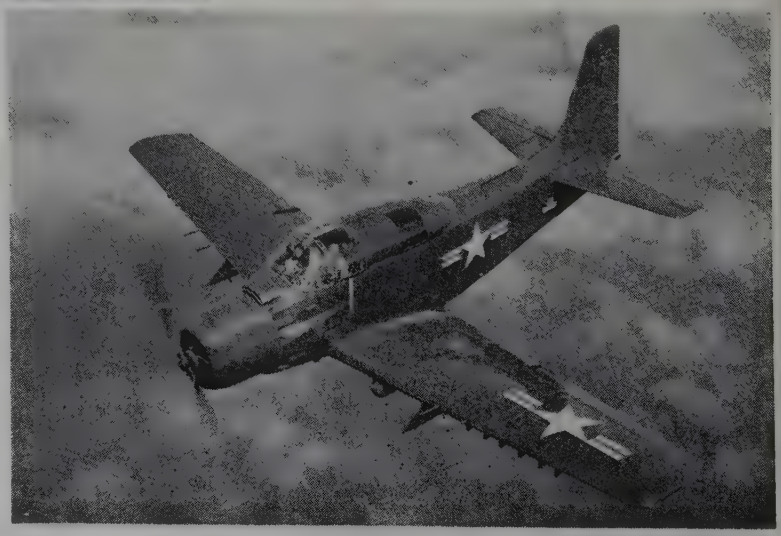
MCDONNELL F2H-3 is the latest version of the *Banshee*. A single-seater, it is powered by two Westinghouse J-34 turbojets of 3600 pounds thrust each. The F2H-3 has a longer fuselage than earlier *Banshees* and has greatly improved radar for all-weather combat missions. It has a speed of more than 600 mph and a service ceiling over 40,000 feet. It is armed with four 20-mm cannons; has greater range than the earlier F2H-2.

MCDONNELL XF3H-1 is McDonnell's newest carrier-based jet fighter. Called *Demon*, it is powered by a Westinghouse J-40 turbojet of over 8,000 pounds thrust. Like a *Banshee*, it is a single-seater. The *Demon* has a speed of more than 650 mph and service ceiling above 45,000 feet. Performance details, specifications and armament remain classified. In addition to McDonnell, Goodyear will also build the new F3H-1.

NORTH AMERICAN FJ-2 is an advanced model of the FJ-1. A sweptwing jet fighter, the FJ-2 is powered by a General Electric J-47 turbojet engine of 5200 pounds thrust. Called *Fury*, it has a speed of more than 650 mph and a service ceiling above 45,000 feet. From an appearance standpoint, the difference between the FJ-1 and the FJ-2 is the sweepback of the FJ-2's wing. The new *Fury* is armed with four 20-mm cannon instead of 50-cal. machine guns, and has a range of about 1,000 miles. The FJ-2 has a wing span of 37 feet; is 37 feet 7 inches long.

Attack

DOUGLAS AD-5 is the "Multiplex" bomber version of the *Skyraider*. An attack airplane, the AD-5 is powered by one Wright R-3350-26W engine of 3,150 hp. Speed is listed in the "over 350-mph" class. Bristling with armament in the form of machine guns, rockets, etc., the AD-5 can carry as much as 8,000 pounds of bombs, rockets and torpedoes in its varied operations from aircraft carriers.



DOUGLAS A2D is a turboprop attack plane designed to ultimately succeed the AD *Skyraiders*. It is powered by one Allison T-40 turboprop engine housed in the fuselage (5500 estimated hp), and driving a six-bladed counter-rotating propeller. Exhaust openings aft of the wing add jet thrust. Called *Skyshark*, it is said to have a speed in the "400-mph class," and "unusually high operating altitude;" in limited production.

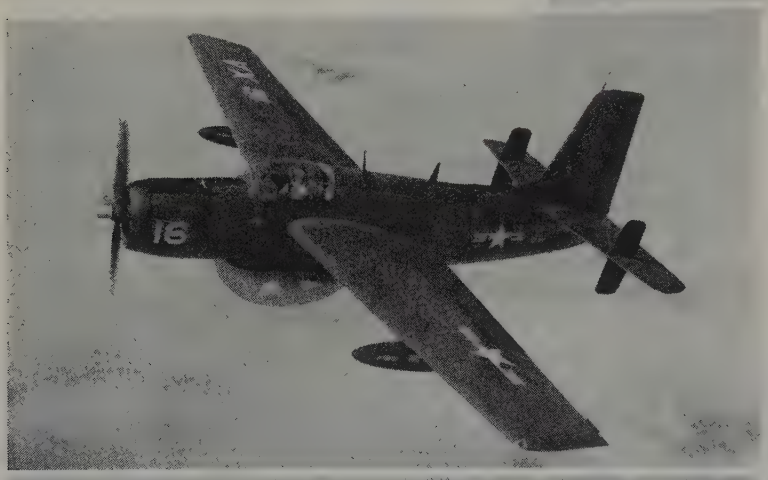
DOUGLAS XA3D is a twin-jet carrier-based plane said to be powered by two Westinghouse J-40 units of more than 8500 pounds thrust. Each jet unit is slung in a pod under the wing outboard of the fuselage. Speed is given as "in the 600 to 700-mph class." The XA3D is a swept-wing aircraft with a crew of three. Specific details of performance and armament have not been released as yet, but it is said to be able to carry a very heavy bomb load.

NORTH AMERICAN AJ-1 is one of the largest and heaviest carrier-based attack planes. Powered by two Pratt & Whitney R-2800 engines of 2300 hp and one Allison J-33 of 3900 pounds thrust, the AJ-1 has a speed over 350 mph. The Pratt & Whitney engines are mounted under the wings, and the J-33 turbojet unit is mounted in the aft section of the fuselage. It carries a crew of three. It eventually will be replaced by the new AJ-2.

NORTH AMERICAN XA2J-1 is another three-place carrier-based attack plane. The XA2J-1, however, is powered by two Allison T-40 turboprop engines of an estimated 5500 hp. The turboprop engines turn six-bladed counter-rotating propellers. Called *Savage*, it is capable of speeds in excess of 400 mph, has a maximum take-off gross weight of more than 26 tons; is heavier than the AJ-1. It is armed with 20-mm cannon and can carry a bomb load of 10,000 pounds. The XA2J-1 has a wing span of 70 feet. The wing tips fold inward and the vertical stabilizer downward for easy carrier storage.

Patrol

CONSOLIDATED VULTEE XP5Y-1 is a 60-ton seaplane that can get off the water with full load in less than 30 seconds. Powered by four Allison T-40 turboprop engines of 5500 hp each, the XP5Y-1 has a speed in excess of 350 mph. Designed for long-range missions, it can carry bombs, torpedoes, mines, etc. It is equipped with radar.



GRUMMAN AF-2W is an anti-submarine aircraft known as the *Guardian*. Powered by a Pratt & Whitney R-2800 engine of 2300 hp (TO), it has a speed of 275 mph. Two versions of this aircraft have been built (AF-2S and AF-2W) to form a deadly "hunter-killer" team to seek out and destroy enemy submarines. The AF-2W is the anti-sub search plane, while the AF-2S is the anti-sub attack plane. Note the radar pod on the underside of the fuselage. Performance is the same for both.

LOCKHEED P2V-5 is newest version of the *Neptune*, anti-submarine aircraft. Although the P2V-5 resembles its predecessors, the visible difference is the added nose turret and larger center-mounted tip tanks. Powered by two Wright R-3350 engines of 3,250 hp (TO) each, the *Neptune* is in the "over 300-mph" class and it has a service ceiling of more than 20,000 feet. It carries the latest in radar and, with JATO, was designed to operate from carriers.

MARTIN P4M-1 is an anti-sub patrol plane powered by two Pratt & Whitney R-4360 engines of 3,250 hp each, and two Allison J-33 jet engines rated at 4600 pounds thrust each. Each nacelle houses one Pratt & Whitney driving a prop, and one J-33. Called *Mercator*, it has a speed of over 300 mph. Armament is carried in the nose and in mid-upper and tail turrets. The P4M has a wing span of 118 feet, is 94 feet long and sits 35 feet 2 inches high.

MARTIN P5M-1 is another Navy anti-sub weapon. Called *Marlin*, it is powered by two Wright turbo-compound engines, each developing 3,250 hp, and has a speed in excess of 250 mph. It carries a crew of seven and is equipped with the latest electronic devices for the detection of submarines. Depth charges, bombs, mines, etc. are carried.

Special Purpose

DOUGLAS D-558-2 is a Navy research plane powered by a Westinghouse J-34 and a rocket motor. It was designed to fly at velocities near the speed of sound (761 mph at sea level, 663 mph and 35,000 feet). In a typical flight run, it takes off under its own turbojet power, climbs to above 25,000 feet, then releases its rocket power. In about two minutes it reaches its highest speed, then returns to its base by turbojet. Called *Skyrocket*, it is a single-seater, carries 3,000 pounds rocket fuel.

FAIRCHILD R-4Q is a transport employed by the Marines as a tactical and strategic cargo aircraft. A Marine version of the C-119 *Flying Boxcar*, the R-4Q is powered by two Pratt & Whitney R-4360 engines of 2650 hp (normal rating). It has a speed of 265 mph, and carries crew of five. It is equipped for simultaneous dropping of 20 500-pound bundles of supplies along with 42 fully equipped paratroopers. Ventral fins have been added to the R-4Q's tail.

GRUMMAN UF-1 is a Navy amphibian capable of performing as a hospital plane, air-sea rescue, cargo, transport or photo aircraft. Powered by two Wright R-1820 engines of 1,425 hp each, it has a top speed of 257 mph and cruises 225 mph. Called *Albatross*, it has a wing span of 80 feet, is 61 feet long. As a hospital ship, it can accommodate 12 litter patients in addition to a crew of six. It is equipped with reverse-pitch props for small-field landings.

NORTH AMERICAN AJ-2P is a carrier-based reconnaissance bomber. It is a 25-ton aircraft powered by two Pratt & Whitney R-2800 engines and one Allison J-33 turbojet. Operated by a crew of three, it has a speed of about 425 mph. For storage aboard Navy carriers the AJ-2P's wing ends fold up and inward, the vertical stabilizer folds to the right. Heaviest of the Navy's operational carrier-based planes, it carries a total of 18 cameras on its reconnaisance missions.

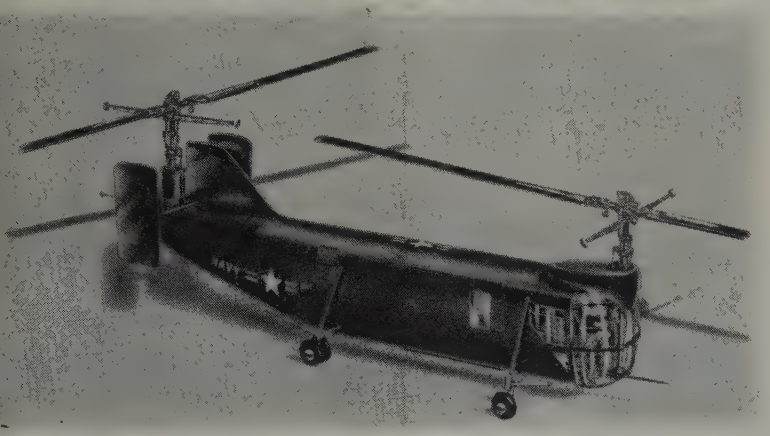
LOCKHEED WV-2 is a *Constellation* especially modified to conduct extensive tests of the Navy's Airborne Early Warning radar equipment. Two of these aircraft have been purchased by the Navy to provide a defense against both low- and high-altitude attack planes. Powered by four 2,650-hp Wright R-3350 engines, it has speed of 300 mph (cruising), a service ceiling of 27,800 feet, and it carries a crew of six. The external radomes house its powerful radar antennae.

LOCKHEED TV-2 is the Navy's version of the Air Force's T-33 jet trainer. A two-seater, it is powered by an Allison J-33 with a thrust rating of over 5200 pounds. It is in the 600-mph class and has a service ceiling of more than 45,000 feet. Armament includes two .50-cal machine guns in the nose, two 1,000-pound bombs carried on wingtip shackles. It also has provisions for JATO, for rocket launching. It has a span of 38 feet 10 inches, is 37 feet 8 inches long.

Helicopters

BELL HTL-3 is a two-place helicopter powered by a Franklin 6V4 engine, vertically mounted, rated at 178 hp. It has an all-Plexiglas cabin for increased visibility. The Navy and Marines are using the HTL-3 in Korea for liaison work and rescue operations. According to a late report (May), the Bell HTL's have been used to evacuate 8500 wounded from the front lines in Korea. The HTL-3 helicopter has a cruising speed of about 80 mph and a range of about 175 miles.

BELL HTL-4 is one of the helicopters performing yeoman service in rescue operations in Korea. According to a military report, the HTL-4's are also being used to lay telephone wire between front-line positions. Powered by a 200-hp Franklin 0-335 engine, the three-place HTL-4 cruises at 78 mph and has an initial rate of climb at gross weight of 400 fpm. It has a top speed of about 100 mph and a normal range of about 170 miles. The HTL-4 is being used by both the Navy and Marines.



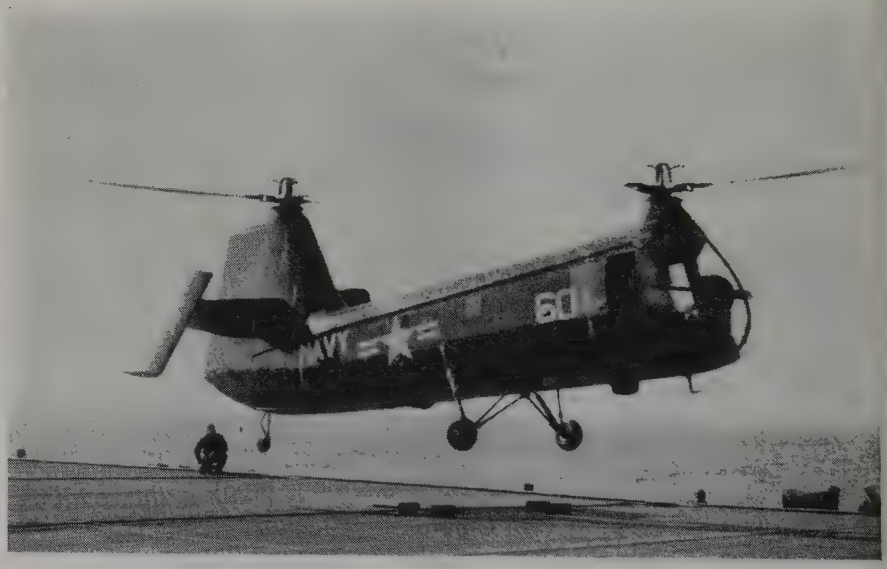
BELL XHSL-1 is the first helicopter to be specifically designed for anti-submarine warfare. The tandem-rotor XHSL-1 marks Bell Aircraft's first departure from the familiar single-rotor 'copter. Power is supplied by a Pratt & Whitney R-2800 engine in a buried installation. The XHSL-1's rotors can be folded for elevator transportability aboard aircraft carriers. It employs a quadricycle landing gear, horizontal stabilizers, fins. XHSL-1 has a gross weight of 6,000 pounds.

HILLER HTE-2 is a dual-controlled four-wheel landing gear helicopter trainer. It is in operation at Pensacola, and with Naval Reserve helicopter units being activated throughout the U.S. It is powered by a Franklin 6V4-200-C33 engine, rated at 200 hp at 3100 rpm at sea level. The HTE-2 has a gross weight of 2500 pounds, a useful load of 746 pounds, a fuel capacity of 28 gallons. It employs a main rotor and an anti-torque rotor. Its fuselage (seat) width is just under 5 feet.

KAMEN HTK-1 is a helicopter easily converted to use as an aerial ambulance. Quick removal of the left-hand front seat and cyclic seat permits carrying a litter inside the cabin. A jump seat located behind the pilot can be used by either a medical attendant or a casualty. Designed as a 'copter trainer, the HTK-1 is powered by a Lycoming O-435 engine rated at 235 hp. It has a cruising speed of about 65 mph, a vertical rate of climb of 300 fpm, and an absolute ceiling of about 12,000 feet. As shown in the photograph, the left half of the HTK-1's transparent cabin nose opens to facilitate the loading of an internally carried stretcher. Kamen Aircraft is also developing a turbo-rotor version of its Navy R-225 helicopter.

PIASECKI HRP-2 is a 10-place troop transport or rescue helicopter. The '2 is an all-metal version of the Navy's HRP-1 which became widely popularized as the "Flying Banana." The Marines are using the HRP-2 for training and development of assault tactics. It is powered by one 600-hp Pratt & Whitney R-1340 engine which drives two rotors at the extreme ends of the fuselage. It has a top speed of 105 mph, a cruising speed of 92 mph and a vertical rate of climb of 400 fpm. Its crew of two sit side-by-side in the nose of the HRP-2.

PIASECKI HUP-1 was designed for shipboard operations. One of the primary fleet uses for the HUP-1 is plane-guard duty. Operating from carriers and cruisers, the HUP's are undertaking rescue duties until recently performed by an attendant destroyer. Its all-metal soundproofed fuselage has accommodations for a crew of two and four passengers or three stretcher cases. An internally operated rescue hatch next to the pilot's seat is large enough to allow passage of a loaded stretcher. It is powered by a 525-hp Continental engine.



PIASECKI HUP-2 is a higher powered version of the HUP-1 and is being used in connection with anti-sub operations as well as plane guard and utility duties. A hydraulically operated hoist above the rescue hatch (*see HUP-1*) is used for hoisting survivors while hovering. If rescue sling is used, the pilot can handle the whole operation without assistance. The HUP-2 is powered by an up-rated model of the Continental engine. It has a top speed of more than 120 mph, cruises at 85 mph and has 950 fpm vertical rate of climb, a 12,000-foot ceiling.

SIKORSKY HO4S is a transport or rescue helicopter powered by a Pratt & Whitney 600-hp. engine. It has a capacity of 10 passengers or eight litters and one attendant. It carries a crew of two, has cruising speed of 80 mph, top speed of over 120 mph, a maximum take-off gross weight of more than 8,000 pounds. It has a combat radius of over 200 miles (statute). A development of the H-5H, the HO4S has clamshell doors which give ready access to the engine in the nose. It is equipped with a power-operated hoist for rescue work.

SIKORSKY HO5S is another liaison/rescue helicopter developed by Sikorsky. Powered by a Franklin O425 engine rated at 245 hp, the HO5S has a speed of over 100 mph, a service ceiling of more than 20,000 feet and a combat radius of over 100 miles. It carries three passengers less copilot or two litters plus one attendant. It normally carries a crew of two. The HO5S is transportable in the Navy's Fairchild R-4Q. HO5S' cabin is heated and ventilated and carries defogging equipment. The HO5S has a gross weight of 3.000 pounds.

SIKORSKY HRS is the Marine version of the Navy's HO4S. It is a 12-place utility helicopter used for troop and cargo transport and for air rescue. The HRS-1's Pratt & Whitney 600-hp engine is mounted in the nose and employs a drive shaft that slopes up to the base of the rotor pylon, clear of the main cabin which is situated below the main lifting rotor. It has a quadricycle landing gear that is interchangeable with an amphibious gear. The pilot's compartment is located above the main cabin and seats two. It has 16,000-foot ceiling.

New York Approach

By W. A. Dixon

Place a pencil on New York City. Swing an arc out 100 miles in any direction. Encompassed in this circle is the most complex, busiest mass of air in the world. Into this area flows the air commerce that serves the nation's greatest city.

The first glance at the airway and approach charts which map the air above this sprawling metropolis, is enough to inspire misgivings in almost any pilot. However, although the airways offer the impression of crowded confusion and the approach and departure procedures are undeniably complicated, a properly trained and experienced pilot should encounter no unusual difficulties flying into New York.

It is assumed that the pilot is flying a well-equipped airplane. For dependable bad-weather operation in the area, VHF two-way, ADF, and ILS are mandatory. Range and radar approaches may be made into LaGuardia, for instance, but ILS is the primary landing aid.

Because of the series of mishaps which resulted in the temporary closing of Newark, it has become more important than ever that the rules affecting flying in the region be followed to the letter. The CAA and CAB are being subjected to tremendous public pressure and, doubtlessly, will not hesitate to file against pilots who violate any civil air regulation in this critical district. Ignorance of the procedures, the radio aids, holding patterns, and airport rules are not acceptable alibis.

Considering the seriousness of the situation, it behooves every pilot—airline, executive or private—to be as familiar as possible with any area he plans to fly in. There is nothing which will more clutter up a smoothly functioning approach sequence than a pilot who doesn't understand his clearances and what is expected of him. He can stack up traffic for untold miles and, if he becomes lost, the ensuing tie-up can interrupt and confuse traffic to a grievous extent.

Probably the best way for a pilot new to New York to keep from stumbling into such a plight is to study in advance the applicable Radio Facility area and airport approach charts, issued by the Coast and Geodetic Survey. Another indispensable tool, if you do not own a Jepson Manual (airlines furnish their pilots with special area and approach plates), is the *Air Route Traffic Control Center Holding Procedures.* It may be secured by writing to the Department of Commerce, Civil Aeronautics Administration, First Region, LaGuardia Field, New York. It lists such essentials as holding patterns, fixes and minimum altitudes.

If Approach Control clears you to the Holmes southwest holding pattern to maintain 5500 feet, you don't want to have to wiggle in your seat with a "Where in the hell is that" feeling! Have a good idea beforehand where the key points are. The more you know in advance, the less you'll have to look up. The result will be a smoother, more confident and more competent flying job. But if you are uncertain about a clearance or any other matter affecting safety, don't hesitate to ask the appropriate controller for clarification. Even veteran airline and executive-plane pilots based in New York occasionally have to ask for a repeat or pose a question. Above all, have your pertinent charts available for instant reference—on your lap is hard to beat.

Something every pilot flying into New York should do at his first opportunity is to visit the tower. In this case it will be LaGuardia. Select a slack hour, so the tower men will have a chance to talk to you and answer your questions. They like to explain their problems and listen to yours.

Luckily, when your reporter visited LaGuardia Tower, there was a controller free who could take time to point out how the tower was set up.

"Notice there are four operator positions, plus that covered booth, which is where the radar equipment and operator are housed," he explained. "Out in the parking lot," he gestured, "is the surveillance radar antenna which is utilized for general monitoring of traffic in the area. A separate scope is used for this. You remain on tower after take-off *until he clears you to radar control.* Radar then vectors you out of the area as necessary, until you reach normal altitude and time separation standards. Your initial clearance with this style departure is not to destination but just to a fix, say to Paterson homing facility, westbound. An additional clearance is ready for you by the time your aircraft reaches that fix."

Installed in the same booth is the precision approach radar screen. Weather minimums for it are the same as for ILS: 400 feet and ¾ miles.

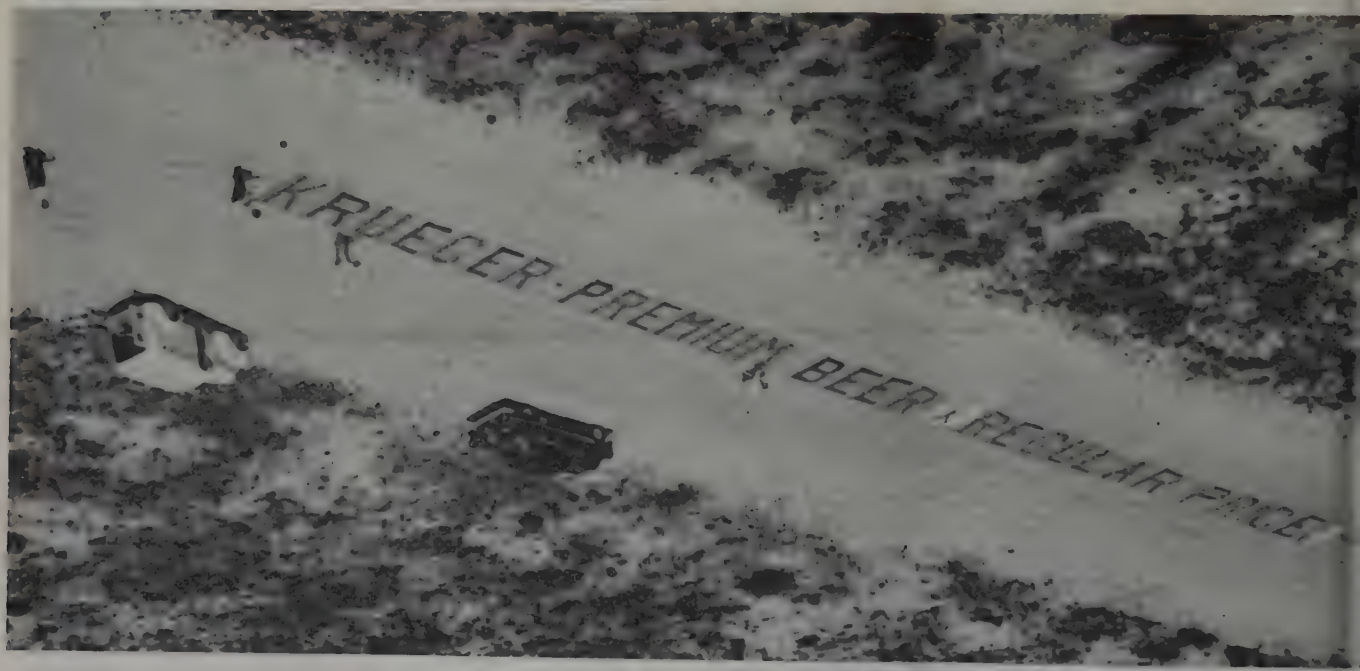
"ILS is normally monitored by GCA when the ceiling is under 1,000 feet. (*Continued on page 57*)

CHART RF 26A *(right)* **is the New York Approach chart. For safety sake every pilot flying this area should know correct procedure, use two-way radio**

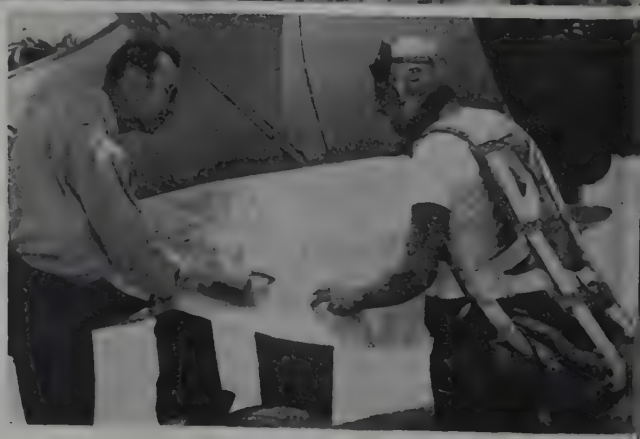

JOINS RF 25
JOINS RF 26
75° TO EAST SCRANTON
TO STEWART
CRYSTAL LAKE
219 CYE
VOR
ALLENTOWN
117.5 ABL
ALLENTOWN
320 ABL
VOR
CALDWELL
115.4 CDW
PATERSON
347 PNJ
POUGHKEEPSIE
215 POU
VOR
WILTON
113.6 ILT
NEW CANAAN
BRIDGEPORT
221 BDR
NEW ROCHELLE
275 RWC
PORT CHESTER
LA GUARDIA
(CLASON POINT)
200 LGA
GLENCOVE
GREAT NECK
ST JAMES
BETHPAGE
323 BPA
BABYLON
272 BBN
NEWARK
341 EWR
NEW YORK
(FACS)
WSY
CHATHAM
254 CAT
LINDEN
350 LDN
FLATBUSH
353 FBM
MITCHEL
201 M
MITCHEL
227 MEM
ISLIP
FIRE ISLAND
CONTROL
1169
RACON
8310 mc 2-1-1-1
SCOTLAND
FLOYD BENNETT
532 NSC
IDLEWILD
240 IDL
SCOTLAND
264 C
MATAWAN
WILLOW GROVE NAVY
391 NXX
RACON
8310 mc 1-2-2
N PHILADELPHIA
371 PHF
FREEHOLD
ASBURY PARK
LAKEHURST NAVY
520 NEL
POINT
PLEASANT
RACON
3250 mc 2-1-2
McGUIRE
238 WRI
MILLVILLE
365 MIV
FORKED RIVER
VOR
WEST CHESTER
112.3 ESR
NEW CASTLE
250 LG
PHILADELPHIA
206 PHL
WEST CHESTER
HARRISBURG
242 HAR
WDEL
1150
WCAU
1210
KYW
1060
WSAN
1470
TOPTON
TYA
SLATINGTON
LEH
ATLANTIC
CONTROL 1167
SOUTH ISLAND
TO MILLVILLE
TO ATLANTIC CITY
TO TUNA
TO BERWICK
TO SUNBURY
TO COATESVILLE
TO CANVET
JOINS RF 35
JOINS RF 26
Distances on this chart are on both NAUTICAL and STATUTE MILES and are indicated thus: 96 (111)
NAUTICAL MILES without parentheses
STATUTE MILES in parentheses
MAJOR CHANGES
N Y. control zone revised. Crystal Lake changed to Comp reporting pt; Mileages shown in both Nautical and Statute Miles
STATUTE MILES
NAUTICAL MILES
Published at Washington D C by the U S Coast and Geodetic Survey
PRICE FIVE CENTS
JUNE 1, 1952
U.S.
RF 26A

Aerial Advertising

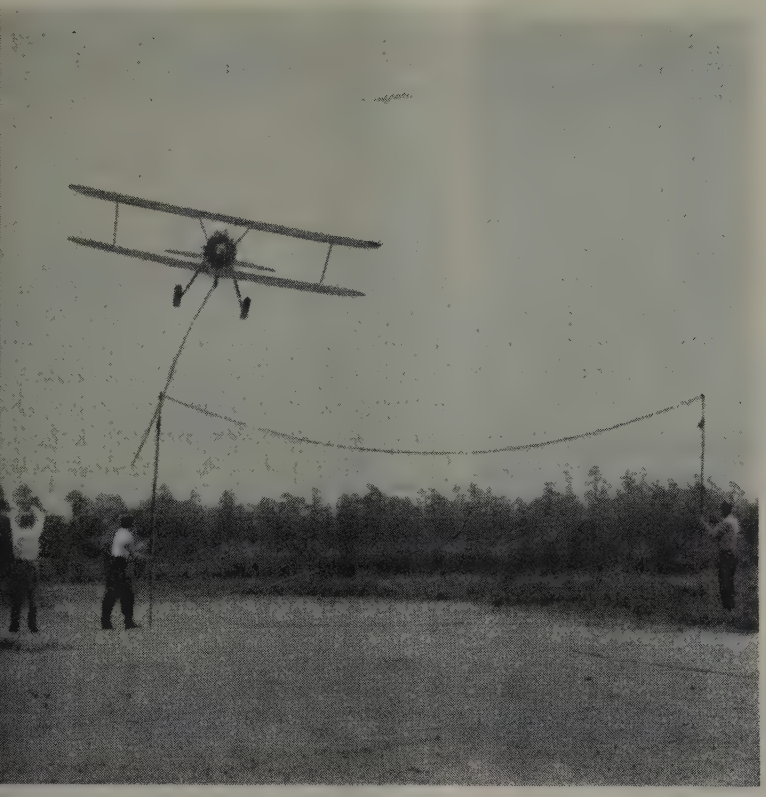
1. First step in banner-towing business is getting banner ready for the pick-up. Here, airport crew unrolls the 150-foot banner on runway



2. Unrolled on the runway *(above)*, the banner is carefully checked. Every snap fastener on every panel and every strap must be inspected before the pick-up line is attached



3. Allan Bass, boss of aerial banner towing business, discusses route to be flown during banner towing flight by Pilot Schwimmer. Every mile is carefully plotted before flight

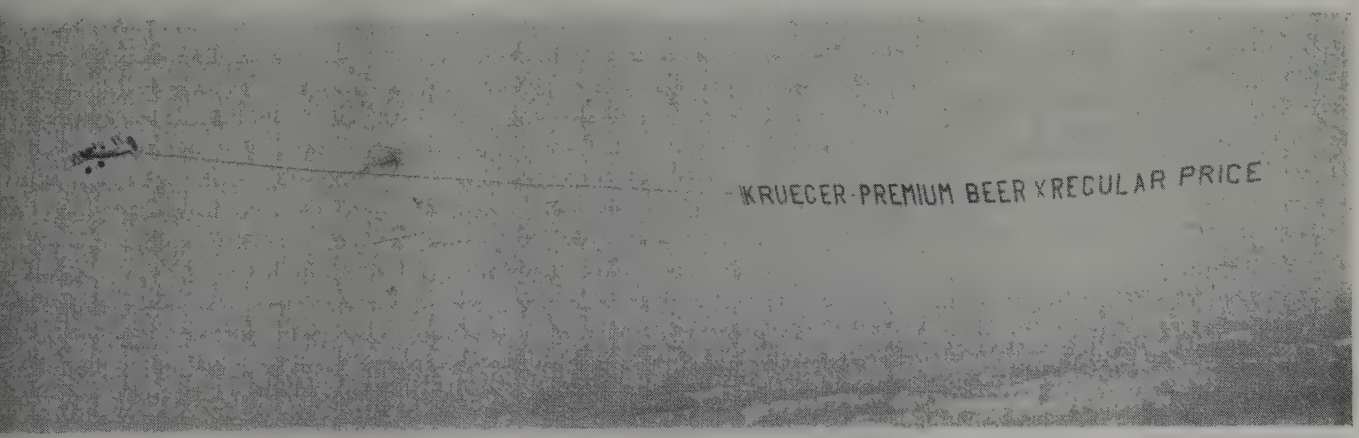


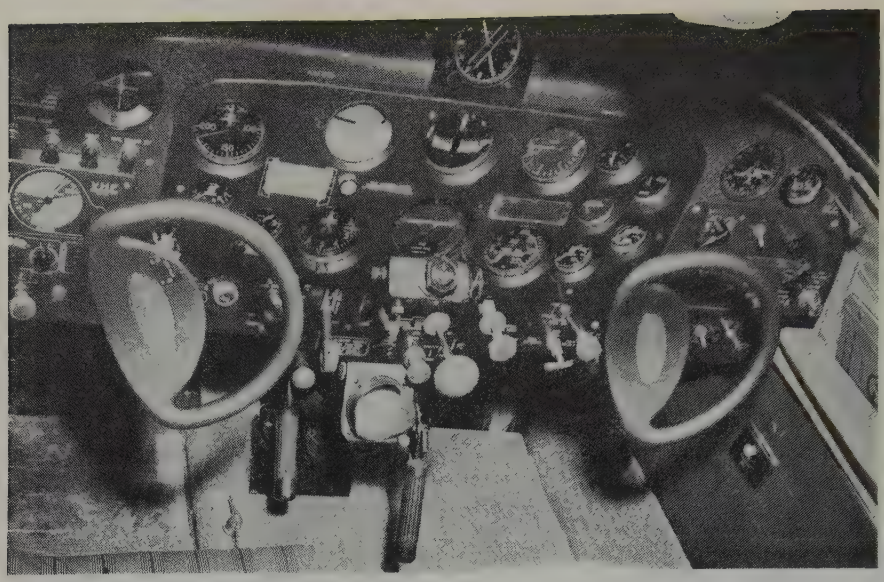
4. This is crucial moment in the pick-up process. The 220-hp Stearman, tow line dangling, comes in low, fast to snatch pick-up line stretched across poles. Man *(left)* signals pilot is on course

5. After pick-up, pilot puts plane into sharp, almost vertical climb. By climbing rapidly, pilot lifts the 150-foot banner off runway. Banner-towing pilots Schwimmer, Richards prefer to fly into strong wind

If you visited a beach on the New Jersey coast or the southern shore of Long Island this summer, you probably were exposed to aerial banner advertising. In fact, you probably were one of 10,000,000 persons on the receiving end of this unusual but highly effective form of mobile advertising. Towing banners is not new, but in recent years it hasn't been widely used. This year, however, there has been renewed activity in the field. The photographs reproduced on these pages are the result of a first-hand look at the operations of a typical, well-organized banner-towing outfit using Lakewood, N. J., airport as its home base. The boss is Allan Bass; the planes, two 220-hp Stearmans.

6. Up and away, pilot heads for the shore with his 75-pound banner. Route starts at Atlantic City, extends to Jones Beach, L. I.





RADIO-TV GODFREY owns *Navion Super 260* as well as DC-3. His *Navion* is one of best equipped flying the skyways today. Panel includes omni, autopilot, ADF, ILS

SHOULDER HARNESS installed in Godfrey's *Navion* is stressed for 1,000-pound pull

SKYWAYS for BUSINESS

News notes of pilots, plane owners operating aircraft in the interest of business

Seven DC-3's Available from Mid-West Airlines

Through Purdue Research Foundation, seven DC-3's formerly operated by Mid-West Airlines will be sold. Mid-West, which stopped operation last May following CAB's refusal to renew its certificate, had 10 DC-3's purchased from Eastern Air Lines. One already has been sold to Remmert-Werner, Inc., St. Louis aircraft overhaul and sales firm. Two of the remaining nine planes will be retained by Purdue University for pilot training in air transportation courses, replacing two Lockheed 10's which will be sold by Purdue along with the remaining seven DC-3's. Two of the seven have been delivered to Purdue Research Foundation, and the remaining five will be delivered later this summer. Cost is about $35,000 each.

L.A. International Opens 8500-Ft. Runway System

Los Angeles International Airport recently opened its 8500-foot main East-West runway system, one of three civil airports in this country with this runway length. According to John W. Reeves, Jr., general manager, Department of Airports, "Approved development plans call for the eventual extension of this main runway system to 12,500 feet, when and as necessary."

There is a half-mile square approach zone at the east end of the East-West runway system, and at the west end, the airport owns an approach zone about three-quarters of a mile long. West of this approach zone to the ocean, the land is at present unimproved.

Fairbanks Morse Co. Flies New Executive Lockheed PV

Fairbanks Morse Company, Chicago, has a new executive transport, a completely reconditioned Lockheed PV-1. The twin-engine air transport recently underwent a complete overhaul and engines changes in the shop at AiResearch, Burbank, California.

The Fairbanks Morse PV-1 features a new executive interior with picture windows, and new radio, electrical and oxygen systems. Installations also included a Sperry autopilot, a Zero Reader and gyrosyn compass. FM representative on the project was Jack C. Jones. The company is a member of CAOA.

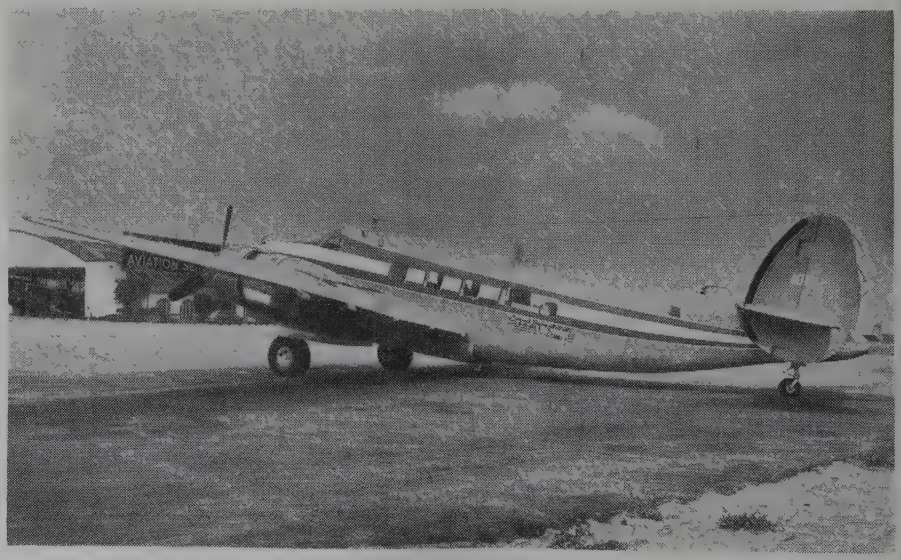
CAA Directive 52-10

Not later than August 1, 1952, all operators of C-46 aircraft will be required to provide circuit protection for the leads in both ammeters in the electric power system where the ammeter shunt is located in the positive generator lead. This Directive requires that a circuit breaker or fuse be installed in each ammeter lead as close as practicable to the shunt.

Fire System Amendments

Operators of passenger-carrying aircraft with engines rated at more than 600 hp each should be prepared for amendments to Parts 41, 42, and 61 of the CAR. The Bureau of

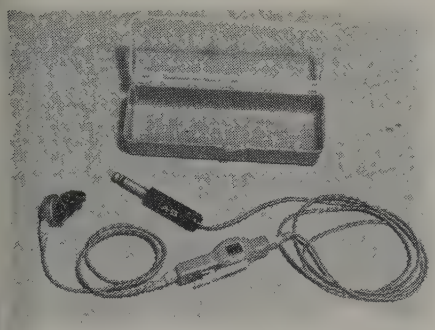
FAIRBANKS MORSE PV-1 features a new executive interior with picture windows, along with new radio, electrical and oxygen systems. Installation includes Sperry autopilot



Safety Regulations is considering amendments which would require all aircraft operating in passenger-carrying service with engines rated at more than 600 hp each to be equipped with a fire extinguishing system which provides at least two adequate discharges, considering the design of the system, quantity of extinguishing agent, and its rate of discharge.

New Type Single-Phone Headset Now on Market

Recently approved by the CAA after extensive laboratory and flight tests, a new single-phone type headset, called "Airphone," has been placed on the market. The unit may be used by airline, commercial and private pilots and radio operators as a replacement for the old type headset. The "Airphone" consists of a specially designed miniature earphone similar to those used in hearing aids, but more rugged in design. The earphone is attached to a supporting



AIRPHONE weighs just a few ounces but is more sensitive than conventional earphones

individually fitted earpiece by means of a snap fastener. Component parts include a personal volume control with lapel clip, two double-twisted vinyl-covered cords and a PL-55 plug. The complete assembly weighs only 2½ ounces, but is 12 times more sensitive than conventional earphones. It is, therefore, used with only one ear, leaving the other clear for cockpit conversation.

The "Airphone" was designed by airline pilots and radio operators in cooperation with a leading acoustical engineering laboratory. They found that the principles of engineering hearing aids could be applied to their problems of fatigue, ear soreness, lack of clear signal, searching for volume controls in strange aircraft under night and instrument conditions, and trying to hear cockpit conversation and radio signals simultaneously. The "Airphone" unit is made to CAA specifications, and is distributed by Airphone Co., Calumet Bldg., Miami, Florida. Price for the complete unit, including handy carrying case, is $20.98.

Gopher Aeronautical Stocks Beechcraft and DC-3 Parts

Beechcraft and DC-3 owners will be interested in an announcement recently received from Gopher Aeronautical Corporation located at Wold Chamberlain airport in Minneapolis. This company reports it is the exclusive Beechcraft dealer for that area, and stocks a complete line of Beech parts, plus a very large supply of DC-3 parts. Gopher specializes in servicing and maintenance of executive aircraft.

. . . in the Corporate Hangar

A Twin Beech owned by Olin Industries and one owned by Gaylord Container Corporation are sporting new interiors installed by Remmert-Werner, Inc. At the same time the interiors were being done, the Olin Beechcraft received a 3,000 hour check, and the Gaylord Container Twin Beech underwent an engine change.

The Texas Company's Grumman *Widgeon* is back in service after airframe repairs at Southwest Airmotive. Chuck Hanna, Texas' pilot, flew the plane back to its base at Houma, Louisiana.

Midwest Tool & Engineering Company's new Cessna 195 was brought to Roscoe Turner Aeronautical for a complete radio installation which included ARC Type 17, Narco Omnigator and Lear 2 Autopilot and an ADF 12. A Marker Beacon and Altitude Controller also was installed. The 195 is owned and flown by Earl Brane, Executive Vice President of Midwest.

Stamford Rolling Mills' *Lodestar* is at Lockheed Aircraft Service, N. Y. International (Idlewild) Airport, for complete fuel tank resealing.

Pilot D. E. Nicholas brought Universal Map and Survey's Twin Cessna to Roscoe Turner Aeronautical for Lear ADF 12 and VHF transmitter installation.

Delhi Oil Corp. recently bought The Lucerne Corporation's *Lodestar* and it is now at Southwest Airmotive for repairs. Lucerne's old crew, Bill Powell, pilot, and Walt Mims, copilot, is still flying the ship.

Alleghany Ludlum Steel Corporation's *Lodestar* (N42013) is back in service after fuel tank patching, landing gear cycling, complete inspection and other miscellaneous services at Lockheed Aircraft Service's Burbank plant.

Ted Soper, pilot of the Plymouth Oil Company's Cessna 190, brought the Cessna to Southwest Airmotive for an engine change. Home base for Plymouth Oil is Midland, Texas.

Two Martin B-26's, owned by Tennessee Gas and Transmission Company, Houston, Texas, are at AiResearch Aviation Service for complete overhauls. Included will be installation of executive interiors, complete radio, electrical and oxygen systems. Overseeing the operation at AiResearch is Tony Zuma, chief pilot for Tennessee Gas and Transmission.

Bob Hunton and E. M. Jackson, pilot and mechanic of the Ralph Lowe *Lodestar*, flew the ship to Southwest for an engine change.

A Lear ADF is being installed in the Standard Motor Parts Company *Bonanza* by Roscoe Turner Aeronautical. Herschel Helm, Manager and part-owner of the company, flew the ship to Indianapolis.

Robert Schwarzenbach of the Schwarzenbach Huber Company brought his *Bonanza* to Atlantic Aviation, Teterboro, N. J., for 100-hour inspection. Mr. Schwarzenbach recently returned from a trip to Lima, Peru in his C-35.

The *Bonanza* belonging to Comfo Sleep Corp., of Wakarusa, Ind., is back in service after its annual inspection at Butler Aviation, Chicago.

Bethlehem Steel's *Lodestar* (N2361) is out of the hangar at Lockheed Aircraft Service, Burbank, after a 4,000 hour check and service. The company's newer *Lodestar* (N4251-V) is in the shop for an airframe overhaul.

After the installation of a dual set of gyros, a newly designed instrument panel and a 100 hour inspection on the Michigan Tool Company's Twin Beech, Paul Holtz, company pilot, has flown the plane back to its base at Detroit.

Superior Oil Company's *Lodestar* is back flying the business skyways after a tank reseal at Lockheed Service.

Carl Lewis, pilot for Skylark Charter, Decatur, Ill., had his company's Twin Beech at Roscoe Turner Aeronautical for landing gear work, general servicing and inspection.

CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the members firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. CAOA headquarters are located at 1029 Vermont Ave., N. W. Washington 5, D.C. Phone: National 0804. Executive Director of CAOA is Herbert O. Fisher.

Aero Commander

Executive Director Herb Fisher had the opportunity recently, at the invitation of Mr. R. T. Amis, president of the Amis Construction Company and president of the Aero Design and Engineering Company, to test fly and make an evaluation of the new twin-engine Aero *Commander* executive aircraft.

Fisher was accompanied by Mr. Emmett Morse, Chief Pilot for Aero Design, on the evaluation flight and, from all reports, the flight was extremely successful, the airplane living up to its high performance and safety kudos previously commented on by the Press.

SKYWAYS is running a monthly series of feature articles on the flight testing of various executive aircraft and vendor's airplanes. The first one to appear will be the Martin 4-0-4 in October and the Aero *Commander* story in November.

The purpose of this series is to evaluate for executive use and information each of the aircraft now on the market, and such accessories as radios and navigational equipment that are of interest to corporate pilots for possible use on executive aircraft.

A CAOA Member Speaks

Here is a letter, recently received at CAOA headquarters, which we feel will be of interest to all pilots.

"Dear Mr. Fisher:

"I am writing to give you my findings on the CAA change from statute to nautical mileage. Being greatly in favor of nautical miles, I was sorry to see the CAA put out an order on June 5 cancelling the proposed change on July 1.

"I had used statute miles during my 10 years of flying until we converted an airspeed indicator to knots this spring in preparation for the July 1 change. The first two or three take-offs and landings seemed unusual, if one were used to determining speed by an indicator, but they were not hazardous. Reading mistakes are eliminated by plainly marking the indicator for minimum take-off, single-engine climb, normal climb and glide knots. Even if a confused pilot should fail to realize that indicated knots give him greater speed than the same number of statute miles per hour, he has no hazard during a take-off and during a landing.

"The overshoot caused by 15 per cent greater speed should cause no accident in an approach for the customary first third of any safe field. You realize that a correct-speed approach made at a field smaller than necessary for a safety factor is hazardous and I am not condoning or considering this practice.

"For cruising, nautical miles simplify navigation as one works in smaller numbers and correct nautical distances are easily determined on any map.

"The cost of converting indicators could be minimized by having metal or plastic rings marked in knots outside the perimeter of any present indicator. It is no problem and the cost is nominal for any instrument shop to convert an indicator. Having it done during an instrument overhaul, as we did, is very simple.

"The advantage gained by standardizing military, private and commercial flying, either domestic or overseas, throughout the world is one step toward harmony in these troubled times. Air traffic control is becoming more saturated rather than less complicated, so anything we in aviation can do to help them helps us all.

"I believe the CAOA should do everything possible to promote the change to nautical miles.

"Concerning the ICAO phonetic alphabet, I am impartial. I have heard more attacks against this change than against the change to nautical miles. Since we use phonetics infrequently, a transition would take us longer than the nautical mile transition we have completed, but we are very willing to make the change since ICAO considers it important to aviation's growth. Now that aviation has proven its necessity, we must progress to expand our position among the other forms of transportation."

Yours very truly,
s/J. W. Clemow
Chief Pilot
Traffic Department

Pilots List

CAOA headquarters endeavors to maintain a list of qualified pilots who are desirous of obtaining employment in the corporate flying field. Any company desiring to employ additional personnel in this category may obtain a list of pilots from CAOA headquarters in Washington.

Any pilots holding commercial, instrument or ATR ratings, or copilot/mechanics who hold commercial and A/E licenses and who desire employment with corporations operating executive-type aircraft may forward a complete resume of their experience to CAOA headquarters, and are welcome to inclusion on the CAOA list of pilots available for permanent placement as executive pilots at no cost.

Executive Prefix

One of the many activities that CAOA is involved in with our governmental agencies is that of trying to obtain for all corporate aircraft owners the permission to use the word "Executive" as a prefix. In a recent letter from CAA we were denied this.

Mr. Cole H. Morrow, Chairman of the Board of Directors for CAOA, followed up this CAA decision to deny us the right to use the word "Executive," by outlining the fallacies contained in their rejection.

The following are excerpts from Mr. Morrow's letter:

"In spite of the pious statement of high-level CAA individuals to the contrary, it is a fact that preference in traffic control is given to the airlines over corporation planes, even though a corporation plane may be better equipped and capable of carrying out a specific clearance with much more dispatch. The principal reason for this is a lack of 'identification.'

"It is our observation that the operational techniques of ANTC are tailored most exclusively to fit the requirements of the airlines, and routine inertia exerts too much influence in the thinking of traffic control people when some other segment of Aviation wishes to improve the efficiency of its operation.

"Certain other arbitrary actions by CAA in regard to nautical miles, radio alphabet, etc., raises the question as to whether or not CAA actually looks out for the interests of 'civil' aviation.

"One of the charter responsibilities of CAA is the promotion of civil aviation. Corporation flying has already grown by itself and in spite of many regulatory handicaps until it is one of the pillars of support of civil aviation. Even the principal officials of CAA were not conscious of the size of the corporation fleet and the kind of a job it was doing until recently.

"It is essential to the civil aviation industry that this growth be continued and even increased if possible. One of the things which CAA could do to help would be to give 'tangible' recognition to corporation flying through the use of some identification which would give equal consideration in airway operations.

"Such action would also indicate CAA's recognition of the high quality of the corporation-pilot personnel and the extent and quality in which these airplanes are equipped with modern radio navigation aids and instrumentation."

Something New Added

CAOA headquarters's office announces the appointment of Miss Corda Mae Cearnal as Secretary to the Executive Director. Miss Cearnal replaces Mrs. Neil Silsbee, who resigned in June. All members calling or visiting Washington should feel free to call on CAOA headquarters for stenographic help and use of the facilities of this office.

AL-VOR Charts

On July 1, 1952, Approach and Landing Charts for VHF Omni-Directional Range (AL-VOR) of the continental United States

began distribution on an automatic subscription basis at $6.00 per year for a complete set of one each of these charts (approximately 100 charts are now available). Subscriptions will include an initial issue of all charts that are available at the time the subscription is received as well as all revisions and new AL-VOR charts printed during the ensuing 12 months.

For information, write the Director, Department of Commerce, U. S. Coast and Geodetic Survey, Washington 25, D. C.

Hq. Visitors

The following were recent visitors to CAOA headquarters in Washington, D. C.

F. M. DePue
Eastern Airlines
Washington, D. C.

Captain Robert W. Allen
Eastern Airlines
Westfield, N. J.

Captain Arthur F. Ewinger
Eastern Airlines
Jackson Heights, N. Y.

Robert M. Lee, Jr.
United Airlines
Washington, D. C.

Manning H. Kennedy
TWA
Washington, D. C.

N. L. Mitchell
Chief Pilot
Minneapolis *Star & Tribune*
Minneapolis, Minn.

Wayne Hinderaker, Copilot
Minneapolis *Star & Tribune*
Minneapolis, Minn.

E. W. Taylor, Chief Pilot
Olin Mills, Inc.
Springfield, Ohio

Bitner Browne, Attorney for
Olin Mills, Inc.
Springfield, Ohio

W. F. Warren, Chief Pilot
Robert Dollar Company
San Francisco, Calif.

David J. Vaughan, Pilot
Cincinnati, Ohio

Joseph D. Owens, Youth Activities Dir.
Veterans of Foreign Wars
Kansas City, Mo.

Forest R. Conover, Chief Pilot
Ideal Cement Co.
Denver, Colo.

R. S. Vorbeck, Pilot
Ideal Cement Co.
Denver, Colo.

David G. Peterson
Chief Pilot
Sinclair Refining Co.
Tulsa, Oklahoma

Lester C. Forney, Pilot
Arlington, Va.

Cole H. Morrow
J. I. Case Co.
Racine, Wisconsin

N. H. Lee, Chief Pilot
Unit Export Co.
Miami, Florida

Geo. L. Reno, Pilot
Unit Export Co.
Miami, Florida

Harold Robert, Pilot
Unit Export Co.
Miami, Florida

Corporation Aircraft Owners Names

One of the very difficult tasks of CAOA headquarters is that of obtaining an active list of corporate aircraft owners and operators who are at present not members of this Association.

It would be appreciated if all those reading this item would forward the names and addresses of all companies they know of or come in contact with that operate aircraft solely as an adjunct to their business. We would like to have the name of the Chief Pilot or the name of a Company officer to make our records complete. Your cooperation and assistance in this request would be very helpful and these names should be forwarded to CAOA Headquarters, 1029 Vermont Ave., N.W. Washington, D. C.

Interview Reprints Available

Recently Cole H. Morrow, Chairman of the Board of Directors of CAOA was interviewed by one of the leading aviation trade journals. The title of this interview was "Corporation Aircraft Opens Up New Markets." It is very interesting and informative and any one desiring a reprint of the interview can obtain a copy free by writing CAOA headquarters in Washington.

10,000-Mile Tour

Paul Revere's ride, the famous run from Marathon to Athens, the bringing of the "Good News" from Ghent to Aix, and other famous rides of history, had nothing on the nation-wide tour recently made by Watkins sales personnel via the company airplane piloted by Jack Ollom, Chief Pilot, and Gene Hebbler, Copilot. The purpose of the tour was to announce the new National advertising program to Watkins Distributors and District Managers the country over.

Starting from Winona, Minn. on April 16, C. C. Currier, General City Sales Manager, flew to Salt Lake City, Utah; and was joined there by Western Division sales personnel: L. E. Fickett, Oakland Branch Manager; Howard Schmidt, Spokane, Washington, Branch Manager; John Thrune, Oakland, California, City Sales Manager and W. N. Cook, Los Angeles, California, City Sales Manager.

After leaving Salt Lake City, for the following 30 days, the ship flew to Spokane and Seattle, Washington; Vancouver, British Columbia; Portland and Salem, Oregon; Oakland and Los Angeles, California; Winona, Minnesota; Chicago, Illinois; Columbus, Ohio; Detroit, Michigan; Boston, Massachusetts; Newark, New Jersey; Greensboro, North Carolina; Nashville, Tennessee; Jacksonville, Florida; New Orleans, Louisiana; Dallas, Texas; Kansas City, Missouri and back to Winona, Minnesota.

The Watkins airplane traveled some 10,000 miles in making the western and eastern tours. Hundreds of distributors and thousands of dealers were contacted, including practically every Watkins Distributor and Branch and District Manager in the entire country and thousands of enthusiastic Watkins Dealers operating in both city and rural areas.

Thus, the necessary task of making personal contact with as many as possible of the thousands of Watkins Dealers throughout the country in order to secure their full cooperation in the new National advertising program, was accomplished in approximately one month's time. Such a task, if attempted by train, car or commercial airplane, would have taken many, many weeks of grueling travel, costing many times the amount of money that was actually spent on the airplane tour.

In addition, Jack Ollom, Chief Pilot, reports that during the first five months of 1952, the Watkins executive plane flew 163,970 passenger miles and out of a possible 150 days from January 1 to May 31, their DC-3 was in the air 65 days and the pilots were away from home 93 days.

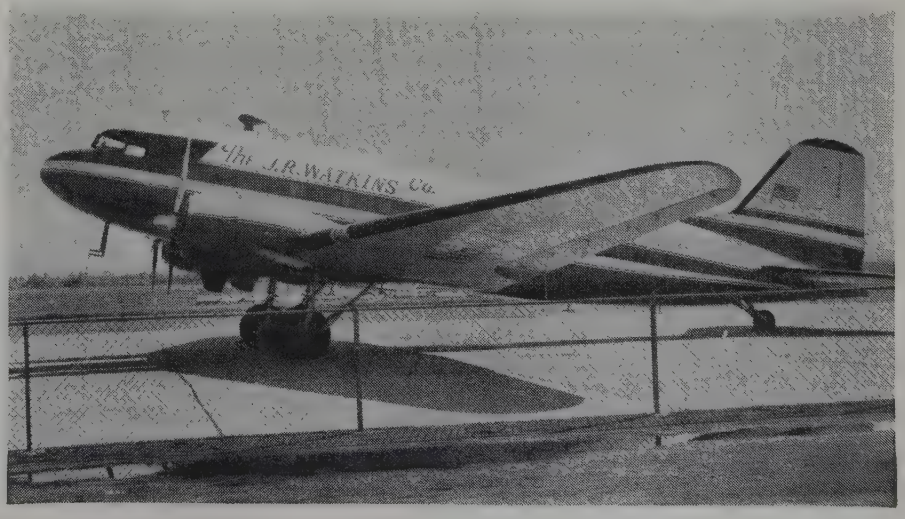
CAOA Calendar and Associated Events

Sept. 25-26— Annual Meeting and Forum of CAOA in Chicago. Blackstone Hotel.

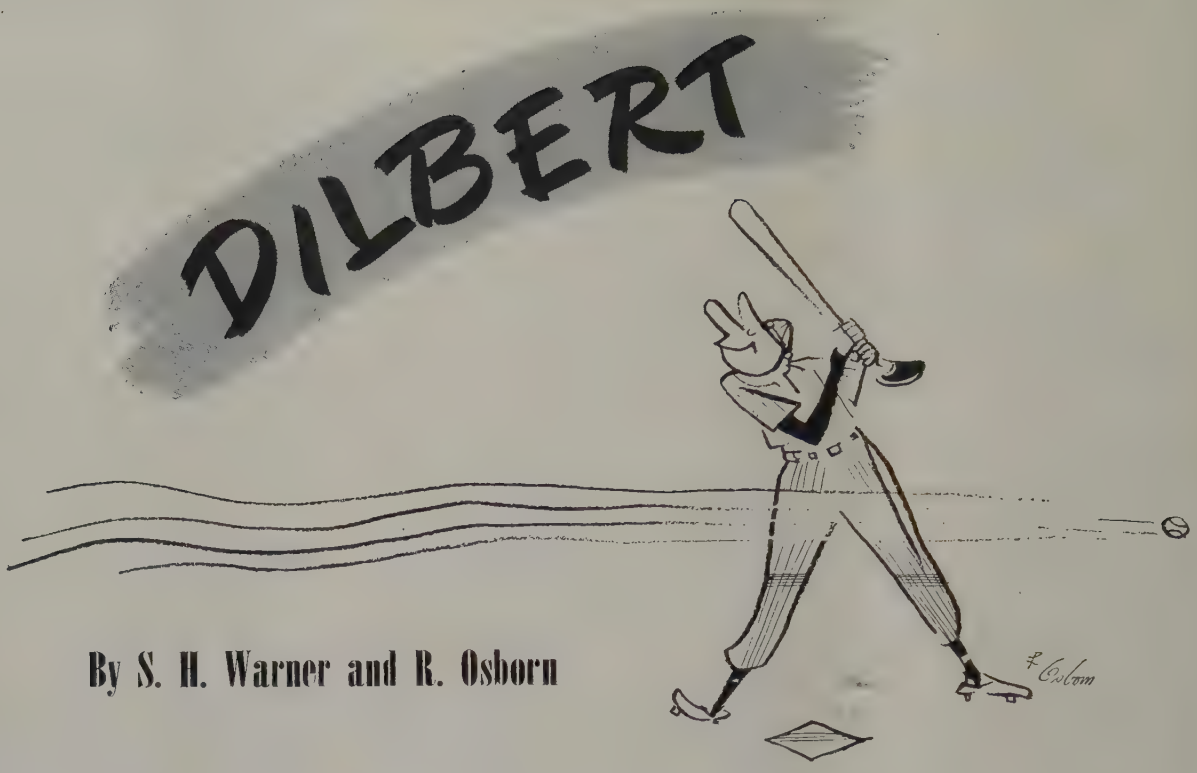
Oct. 9, 10, 11—Cole H. Morrow, Chairman of the Board of Directors for CAOA, will be official representative at the International Northwest Aviation Council 16th Annual Convention, Great Falls, Montana.

Dec. 1952— Chicago division of CAOA and CAA Regional Air Safety forum. The topic will be "Weather Flying" with special emphasis on Icing conditions.

J. R. WATKINS CO. DC-3 recently completed a 10,000-mile business trip. Sales personnel visited Watkins Distributors and District Managers from coast to coast over a period of 30 days



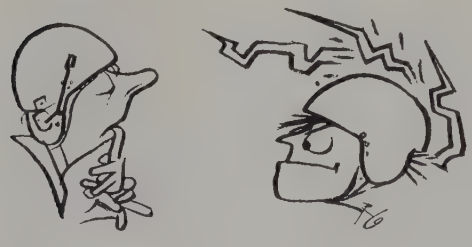
DILBERT



By S. H. Warner and R. Osborn

Emergency Reaction—Note the title word is "reaction," not action. It is mainly a question of time involved, and in an aviation emergency that is paramount. Reaction indicates immediate response and, brother, that's what you need lots of in an emergency. Of course, it must be the *correct* reaction, and that is what this little ditty is all about.

If you haven't visualized your emergency ahead



of time and prepared yourself for it, you are apt to find yourself behind the 8-ball. The trouble is that you seldom have time to study over an emergency in the air and figure out the proper action. You will probably have time for just one quick reaction and, if you haven't gone through it before, your chances of doing the right thing aren't too good.

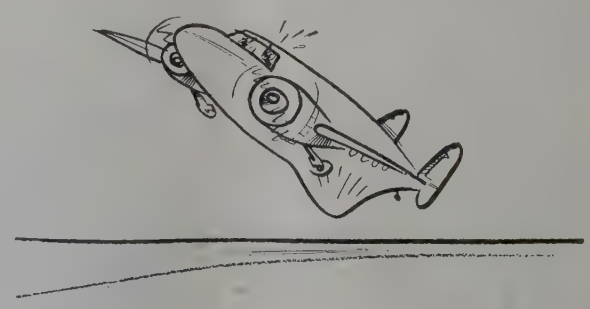
Unfortunately, your natural reaction in an aircraft emergency often is not the correct one. That is why your reaction to emergencies must be conditioned by training.

There are hundreds of emergencies you must be prepared for. Here is an example. Immediately after take-off, your twin-engine cargo plane goes into a steep climb. You naturally push forward on the yoke and roll in down tab, but the nose won't come down. The plane approaches a stall. Your life may depend on your next move. Will you think fast enough to do the right thing? What is it?

Despite the fact that you wish you had a little jet assistance at this point, you must reduce power. You have already tried everything else that will help prevent a stall. A smooth reduction of power should cause the nose to drop; you can regulate the amount with the throttle.

You will probably have to crash land straight ahead. If you have time, drop your flaps. And unless you have plenty of runway left, flip the wheel switch to the up position.

The most likely cause of this emergency was improper loading—center of gravity too far aft.



Are You a Scooter Pilot—Remember the good old days? Remember your first scooter? Remember how you used to put one (*Continued on page 52*)

"Dilbert forgot to check controls for full throw . . . and he hasn't been seen since."

Cutlass F7-U

(*Continued from page 11*)

relatively new wrinkle. It is an extended piece of tailpipe attached to the end of the jet engine. More fuel is added in this extended tailpipe, burned at a temperature the normal jet engine couldn't take and expelled aft at a tremendously increased velocity. This takes lots of fuel but it produces a lot of thrust when you need it.

When you mentally undress an F7U-1 jet fighter, it seems incredible that so much could get into such a small space. Something like 25,000 different design parts are required in the making of this airplane and, because of careful design work, all of the parts go in with no wasted space. One of the standard descriptions of any well put together jet is "so round, so firm so fully packed—." In the *Cutlass* there are some 1700 pieces of tubing, totaling about 5,000 feet (nearly a mile of "plumbing"), to handle the oil, fuel, hydraulic fluid and air flow required. Other jets need about the same. The *Cutlass* has some 40,000 feet, or roughly eight miles, of electrical wiring threaded fore and aft and athwartship and every foot of it was taken into consideration during the design-stage fight for space.

Fuel cells pack areas in both wings and fuselage wherever space is available. It is common knowledge that a jet, to perform its mission, uses proportionately more fuel than a reciprocating-engine airplane. You will find eight or 10 separate fuel tanks in nearly any jet fighter. A standard prop fighter had one or two. The *Cutlass* has eight self-sealing tanks spaced throughout wings, center section and fuselage. They all have to be carefully designed to be joined together, permitting unrestricted and completely reliable automatic fuel flow to the engines at all speeds in all attitudes of flight and at all altitudes. You can best understand the problem if you realize that a jet engine burns some 400 or 500 gallons per hour, or more! It must never stop flowing or, suddenly, you have a "flame out." Then, if time and altitude permit, you must start the engine all over again. The required pumps, valves, strainers and timers in this system form a virtual maze of complicated precision. They are part of a compromise of weight and space. But they permit the pilot to complete his entire flight without having to fumble for various tank selectors for fuel. He turns the selector on when the engines are started. The intricate system keeps fuel flowing throughout the flight until every tank is dry —and even flashes a red light to tell the pilot when the last tank is nearing empty! He can pay attention to the flight.

The cockpit of an F7U-1 *Cutlass*, like any jet, is a mass of controls, instruments, dials, switches, knobs of various shapes and sizes, and lights and selectors. These aren't hard to understand but do require study and getting accustomed to. Surprisingly enough, there is ample room for the pilot and his stick and rudder. Those old-fashioned items, at least, remain quickly recognizable to the pilot of yesterday. Of course, the stick and rudder may no longer directly move the control surfaces as they did previously—we are outgrowing that simple attachment. In many high-performance jets the pilot's control stick (when moved by the pilot) simply moves a hydraulic valve. The valve, in turn, lets the hydraulic oil pressure of 2,000 or 3,000 pounds per square inch, work through a mass of hydraulic tubes, valves, idlers, bell cranks and push rods to move the surfaces out on the wing or tail. It is all necessary because of the high forces (beyond the physical power of a human being to overcome) that are required to move the controls against the pressure of a 600- or 700-mph airstream. But it is still another highly complex system required in a jet which permits the pilot to do his job. Without it, he could only maneuver his lightning-fast machine in slow cumbersome turns—if at all. With it, he is the skillful master of a weapon which, with no more than the flick of a wrist, the pressure of a foot, can be made to twist, turn, parry and roll at the speed of sound.

What are all those black boxes you see as you poke your head into other sections of this jet airplane? Some of them comprise radio equipment, the transmitters, receivers, of which there are several, and the navigation equipment with its assortment of radio compass, antennae, inverters. More of these boxes, full of the finest electronic detail, go into the radar transmitter and receiver, the gunsight and a highly classified piece of airplane identification equipment. The identification is essential—so when your airplane appears on someone's radarscope, he can quickly discover whether you are friend or foe.

Up near the cockpit and surrounded by these boxes is another item important to the pilot of this high-flying, fast-moving jet. The cockpit air-conditioning and pressurizing system, another expensive and weighty item which prop fighters didn't have. It weighs about 60 or 70 pounds and has a capacity of one and one-half tons and may be compared with your home-refrigeration unit which has a capacity of only about one ton and weighs 200 to 300 pounds. This tangle of engineering mastery is now the first love of the pilot in his cockpit. With its outlay of thermostats, regulators, flow controls, turbines and valves, the pilot keeps warm or cool as suits his fancy. When you consider the spread of air temperature from sea level (perhaps as high as 100° F.) to 50,000 feet (minus 65° or colder) you can appreciate the problem which nature presented to the designers of the air-conditioning unit. Extreme airplane speeds increase cockpit temperatures as much as 40° or 50° just because of the friction of the airstream rubbing the fuselage and canopy. A pilot might literally bake unless cooled a bit.

Integral with this same system is the pressurization unit. It is capable of maintaining enough air pressure in the cockpit, as the pilot climbs his airplane into the stratosphere, to keep him relatively comfortable and safe from the effects of greatly reduced atmospheric pressure. This was undreamed of in our old propeller airplanes. I have flown a non-pressurized cockpit airplane on numerous occasions to altitudes greater than 40,000 feet. Never did I feel comfortable or secure above 40,000 feet and such short-duration flights were for experiment and test. In the *Cutlass* at 30,000 feet the pilot's compartment stays at 18,500. At 40,000 feet the pilot is still relatively impervious to the rarified atmosphere outside of his canopy and, thanks to his pressurizing system, he feels only the effect of 26,000 feet altitude. This means, of course, the pilot's efficiency as well as his comfort is retained at a high level. To get this efficient, compact pressure system required more than a year for design of the basic turbine alone and more space and weight were required in the tightly bound fuselage.

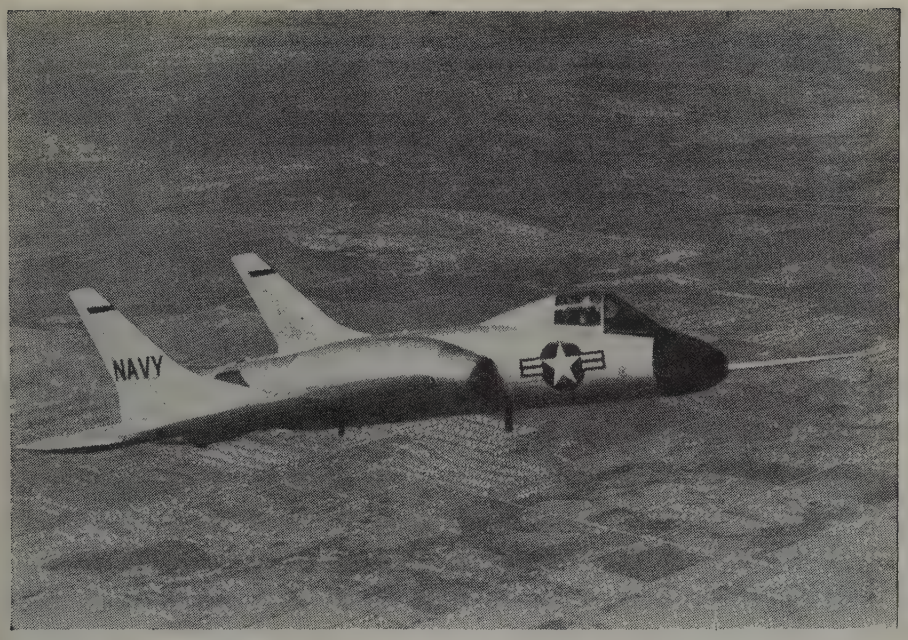
The landing gear has to fold into the airplane somewhere, hundreds of rounds of ammunition, armor protection, and an oxygen supply for the pilot have to go in. Gun heaters, oil tanks, emergency systems for operating the landing gear, canopy, controls have to be provided. The high airspeeds brought on with the advent of the jets made normal bail-out for the pilot an all but impossible method of escape. The ejection seat was devised. It has its own little cannon and guide rails for catapulating pilot, seat and all out into the airstream clear of the disabled airplane. (It has worked satisfactorily at nearly 600 mph.) The pilot then disengages himself from the seat and opens his own parachute to descend to earth safely. You can understand that, as pilots, we vote heavily for the ejection seat. This ingenious device gives us a chance to get out of doomed airplanes and live to fly again. But what a compromise. The whole contraption adds about 40 pounds more. Every pound of weight subtracts from the performance of a jet airplane. It further crowds an already packed cockpit, adds more complication and additional gadgetry to the airplane.

We go to the rear of the ship and watch while a man in the cockpit operates the arresting hook. You see it drop down out of the after section of the fuselage, in a ready position for stopping the airplane when it has landed aboard an aircraft carrier. It is a masterpiece of intricate design and structural forethought requiring months of engineering manpower and laborious research. It must never fail. Several hundred thousand dollars worth of airplane and a pilot's life can hang in the balance.

We watch the speed brakes work. Large flaps that when extended by the pilot can quickly slow the airplane from its thundering high speeds. You use the speed brake for combat maneuvers when it is necessary to make steep dives without gaining excess speed, and for reducing the airplane's speed for landing. I recalled again that first flight in a jet which had no speed brakes. It had taken me two circles of the field before I could get the airplane slowed down enough to extend wheels and flaps. Now, when a pilot approaches a field too fast for landing he can partially cover up his boner by extending his speed brakes.

Along the leading edge of the wings of the *Cutlass* is another item which you may never have seen before. This is a pair of slats. When they are extended just prior to landing, the pilot has better control of his ship at the slow speed and can land at a slower speed. Slats perform a similar function to the flaps which extend from the trailing edge of the wings of most airplanes.

Before turning away from the airplane you might take time for a quick survey of the engines and afterburners with their array of pumps, gear boxes, generators, meters and assorted equipment surrounding each. You would find many more wires, rods, tubing and hose leading away from each engine to somewhere. I recall a brief comment made by an engineer as to the time required to design and complete drawings for the seemingly simple throttle linkage connecting engine controls to cockpit levers. Just designing this package of rods which



LATEST CUTLASS is the F7U-3, faster and carrying heavier armament than its predecessor, the F7U-1. F7U-3 has three times as many access doors as the F7U-1 to reduce maintenance

connect the pilot's throttle levers to the throttle controls on the engine took five months! A goodly portion of such time is spent in just figuring out how to get the rods and levers through, in between, and around the closely packed mass of other equipment that has to get into that nine feet of space between engines and cockpit.

As mentioned before, flying a jet is actually easier than manipulating the controls of a propeller fighter. In the long run, the jet pilot must exercise more judgment in many cases. He does require a more rounded training. If the pilot wishes to obtain the maximum of combat efficiency in his jet machine, he needs to think a little more and much faster, for from the moment he steps into his cockpit until he climbs out, the pace of life increases.

Despite the roar and swish, the lightning speed and dart-line maneuverability of the jet, it remains true that here is just another piece of machinery on the move. A jet will not forgive as often or as readily as a comparable prop model and you could say that if you are going to meet your demise as a pilot rather than as pedestrian or automobile driver in today's mad rush, a jet can probably do the job a bit quicker and less painfully. However, in the next breath you can argue strongly on the other side. You can see much more from the cockpit of a jet and, thus, can be more precise in your landings or in any offensive or evasive action taken in the air. The pressure cabin keeps you far more comfortable and safe at high altitudes, eight or 10 miles up. Furthermore, tactically it permits you to get above 40,000 feet and start your fight. The jet's air-conditioning equipment, while still requiring refinement, is automatic. The pilot is effectively relieved of the chore of keeping his cabin hot or cold, his windshield, canopy and instruments clear of frost that can cloud his vision at the crucial moment. The ejection seat, not a part of the prop-fighter, makes pilot escape easier —at times possible where, otherwise, he would go down with his ship.

In the jet it is almost too quiet in the cockpit. Vibration is negligible. The only noise is a muffled hum from the engine behind, the intermittent crackle of radio reception in your earphones, the solid but moderate sound of an airstream snaking past the canopy. To a pilot this is pure luxury. He has been used to the deafening roar from propeller and exhaust stacks, the always shimmering instrument cases with their quivering pointers, the ceaseless vibrating and shaking of his seat, rudder pedals, floor space. The jet pilot can actually hear what is coming through his earphones these days.

Flying at 500 or 600 mph in a jet is of some particular consequence to the pilot but for somewhat different reasons than most laymen would suspect. The speed itself means nothing, either at 500 or 1500 mph. At 30,000 or 40,000 feet, 600 mph is like sitting in your leather chair with a book in your lap. It is when you start to turn, change direction, maneuver, that things are different. Permissible accelerations, or G's, are no greater in the jet than in the prop fighter but the duration of the "G" factor is much greater. The *duration* of the "G" is equally important to the pilot as the *amount* of the accelerations, or "G," he must bear. For example, you can stand 10 or 12 G's momentarily without ill effect, but 4 or 5 G's sustained for 10 seconds can black you out. You are uncomfortable, can't see through the black eclipse, but you're not unconscious. Anti-G suits, worn much more by jet pilots, raise the threshold at which these effects appear by applying pressure to abdomen and legs.

With the complete ease with which the pilot of a jet can roll, dive and climb, sustained accelerations are common and tiresome. You find yourself wishing you didn't have to go around that next turn very sharply or pull out it that so suddenly.

Flying at the higher altitudes permits one to elude most of the bad weather. But it forces the jet pilot to concentrate harder on navigation, pay attention to radio-directed courses and keep oriented. If you get lost, in a few minutes you may be a hundred miles from your course. Your fuel supply, like your flight, goes fast as you come down near the ground and there is little time to lose finding the field. You must keep well versed in the art of instrument or bad weather flying. In addition to the normal requirement that you fly your airplane without visual reference to the ground, using instruments to fly blind, you must now also sweat out the time factor. The fuel-gage needle flickers toward your nemesis.

Tactically, the many problems commensurate with getting on with the war in the air have changed somewhat. They have moved further upstairs. Since the jet's performance and range is a standout at high altitudes, the normal escorting of bombers, combating enemy opposition, maintaining combat air patrols, is considered in terms of high altitude. Under certain strategic conditions, it has been proved, as in Korea, that the jet can perform low-altitude missions with great success. But its main forte is in the stratosphere. Since his selling point is speed, the jet pilot wants to maintain his speed, not become involved in circular dog fights and slow-speed maneuvers wherein he loses effectiveness. Thus, revision of combat tactics has been a constant evolution with the advent of the high-speed jet.

Contact with enemy air opposition at closing speeds of 1,000 or 1200 mph needs more seeing than you can muster with the naked eye. That's the reason for all the black boxes devoted to search and intercept radar equipment. Without that you might get a fast glimpse of an approaching target but miles of strangely opaque sky would separate your planes before you could turn, track, sight, determine whether friend or foe and fire at him.

If the air happened to be rough as you poured on the coal to track the target on your radarscope or in your electronic gun sight, you would feel a certain respect for your crash helmet. At 500 mph in a jet fighter, air bumps are quick, sharp jabs. The whole airplane suffers these rapid thumps and your head can easily knock back and forth against the sides of the glass canopy. After one pass at the target, if it was at 40,000 feet, for instance, you may as well start home. In the matter of a few seconds, two airplanes traveling at such speeds separate so widely that completing a sweeping arc of a turn and finding the target again becomes a remote possibility.

When you come back toward your own field after one of those swift missions, flip open the control that sends out the speed brakes and point the nose down at the white stretch of runway, you never fail to feel elation. The jet airplane provides more flight facilities at your command, and so performing your task from take-off to landing has been facilitated.

As briefly pointed out, making the jet airplane has been a costly and painstaking task with intelligent compromises needed all along the way. Two items, space and weight, have taken on new values and in the jet are tremendously important. If you guess at the weight of any of the modern jet fighters, try to remember, first, the variety of gear which has to go into one and then place your bet cautiously. The complexities as we go ahead, pushing up speeds and altitudes, are being magnified. The black boxes of electronics are doubling. It isn't a push-button airplane to us pilots as yet but if progress continues, it will be soon.

Soviet Fighters

(*Continued from page 15*)

Istrebitel) which had been built under Heinkel license for the Soviet Naval Air Arm; the I-9 was a heavy twin-engined fighter (two 480-hp M-22 radials) which had a top speed of 232 mph, but both this and the I-10 shoulder-positioned gull-wing monoplane were considered *too advanced*, instances of the bureaucratic suppression that first began to manifest itself at that time rather than lack of originality in Soviet design outlook.

In 1933 Polikarpov produced the I-11, an unusually clean fighter powered by a 750-hp AM-34 12-cylinder Vee engine and featuring a "gull" upper wing and cantilever undercarriage legs. The I-11 held great promise and was acclaimed by its test pilots, but the AM-34 engine was being used in the TB-3 four-engined heavy bomber in production at the Fili plant (Number 22) near Moscow, and as this formed one of Russia's major production efforts, engines could not be spared for the I-11, and Polikarpov was ordered to redesign the fighter for a 750-hp M-25 radial.

In the meantime, Tupolev had re-entered the fighter field with the twin-engined MI-13 long-range naval fighter. The MI-13 was a modified version of Tupolev's SB-1 (ANT-40) bomber which was then faster than most standard fighters. It was powered by two 850-hp M-58 engines and armament comprised one slow-firing 25-mm cannon and two 7.62-mm machine guns in nose, and two flexible 7.62-mm guns in the rear fuselage.

The re-engined I-11 appeared as the I-13 in 1934 and entered quantity production to replace the obsolescent I-5 and I-6 fighters. It shared the assembly lines with a slightly modified version designated I-15 which, like the I-13, was powered by a 750-hp M-25 radial. The two machines differed little externally, and the latter made its operational debut in the Spanish Civil War where its stubby appearance earned it the name of *Chato* (flat-nosed or little one). Some numbers of I-15 fighters were also sent to the aid of China, in December, 1937, where they were mainly to defend Chungking. Although not fast, top speed being 223 mph, the maneuverability of the I-15 made it extremely popular with its pilots.

Under development alongside the I-13 and I-15 single-seaters was Polikarpov's DI-6 two-seater which was similarly powered but its wing arrangement was just the reverse to that of the single-seater, the bottom wing having a "reverse gull" effect downward from the fuselage. Armament comprised four 7.62-mm Sh-KAS guns and two flexible rear-firing guns operated by a gunner in a semi-enclosed cockpit. Hitherto, it has been said that the DI-6 possessed a revolving gun turret but this was not the case, although it did feature the first retractable landing gear to be used by a Soviet single-engined fighter.

Two developments of the I-15, the I-15B and I-15C (or I-153) were powered by Svetsov's 1,000-hp M-63 radial which did much to improve the little fighter's performance, although by that time most major air powers had dropped the biplane in favor of the monoplane. The I-15B differed from the first version, apart from the engine, in having the upper wing center section braced above the fuselage, but the I-15C reverted to the "gull" upper wing and embodied a retractable landing gear.

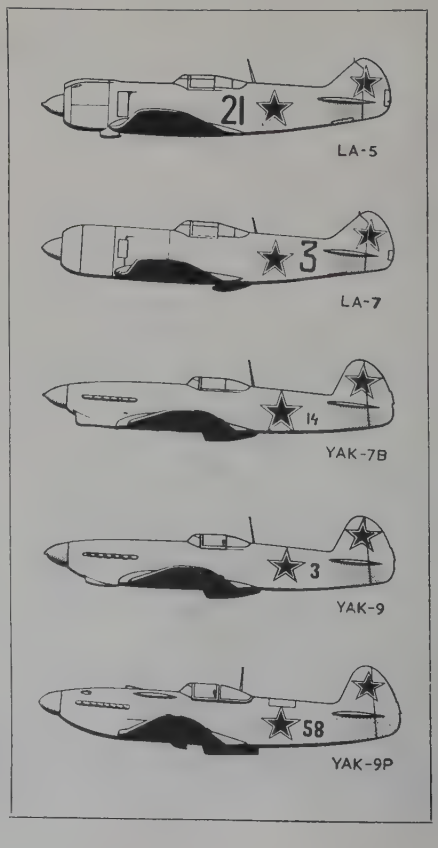
By this time Russia had a number of first-class airplane designers, but the Soviet government lacked the organizational ability to use mass production without allowing the basic designs to become antiquated; the Communists, who were later to be responsible for one of the greatest industrial achievements of this century in moving the greater part of their aircraft industry to the Urals and to Siberia, were strangely overbalanced in sentimental regard for certain basic types left behind by the tread of international progress. The Soviet Union no longer relied upon Germany, Italy and England for its engines and airframes.

It was building considerable quantities of airplanes, Russian in origin if not in inspiration. TsAGI (Central Aero-Hydrodynamics Institute) in Moscow, and other research establishments, had excellent facilities for original development work and, indeed, had it not been for the previously mentioned bureaucratic suppression, might well have brought the Russian airplane industry to the highest world standards. However, as in the following war years, the Soviet Air Staff ordered concentration on strictly orthodox aviation equipment. Airplanes were strictly functional, production simplicity taking precedence over highest fighting efficiency.

Piston-engined Fighters

By 1935 it became obvious even to the Russians that the biplane fighter was approaching the end of its usefulness as a first-line combat airplane, and Polikarpov produced Russia's first production fighter monoplane, the snub-nosed barrel-like I-16.

In its initial form, with a 750-hp M-85 (Gnome Rhone) radial, the I-16 was tested alongside the I-15 in Spain which proved to be such an admirable testing ground for Russian, German and Italian warplanes alike.



Known alternatively as the *Rata* (she-mouse or rat) and *Mosca* (fly), the I-16 was primarily of wooden construction and armed with four 7.62-mm Sh-KAS guns which had formed standard Soviet fighter armament since the I-5 of 1930.

Its low wing loading made it extremely maneuverable in comparison with its Western contemporaries, but it proved to be no match for the early Messerschmitt BF-109 fighters used by the German "volunteers," and it was incapable of catching standard German and Italian bombers.

The results of operational testing in Spain were transmitted to Plant Number 21 at Gorki, where the I-16 was being produced, and the design team immediately produced the I-16B which was fitted with a 1,000-hp M-62 engine which partly rectified the fighters shortcomings by increasing top speed from 240 mph to 285 mph. Further development resulted in the I-16C, referred to by the *Luftwaffe* as the *Super-Rata*, which had a 1100-hp M-88B and an armament of two 20-mm Sh-VAK cannon, produced in 1939 by Vladimirov, and two 7.62-mm Sh-KAS machine guns, but top speed was only 310 mph, and the fighter received a severe mauling at the hands of the *Luftwaffe* for it remained in service until the beginning of the Stalingrad battle.

The next and last fighter to originate on Polikarpov's drawing board was the I-17, or TsKB-19, which brought a touch of modernity into the Soviet fighter prospect despite its lack of success. Powered by Klimov's 860-hp VK-100 (Hispano-Suiza development) liquid-cooled Vee, the I-17 was displayed by Russia at the 1936 International Aeronautical Exhibition held in Paris. It was strongly criticized by Western observers, who noted the poor workmanship of the riveting, the heavy and crudely finished engine, and the poorly varnished fabric which covered most of the wing and fuselage surfaces and could not be disguised by the bright light blue dope with which the I-17 was finished. An extremely complex composite structure was employed for the I-17, and an interesting example of its complications was the ingenious retraction system for the landing gear main members in which the wheels went one way and the radius rods the other in order to clear the main spar.

The I-17 possessed clean, rakish contours enhanced by a long rear fuselage fairing connecting up the fin and unbalanced rudder assembly with the pilot's cockpit. The few production I-17's possessed an armament of one 20-mm Sh-VAK cannon firing through the prop hub and four 7.62-mm Sh-KAS guns mounted in the wing. Performance was poor, top speed being 304 mph at sea level, and Polikarpov's machines fell from official favor. Nevertheless, Polikarpov became a deputy of the Supreme Soviet before his death in 1944.

Nikolai Polikarpov's position in the Soviet fighter design hierarchy was inherited by a number of rising young designers, but it was not until the summer of 1941 that we were to learn of the developments that had taken place in Soviet fighter design since the 1936 era.

A Russian Armenian, Artem I. Mikoyan, and co-designer Mikhail I. Gurevich, entered the field with a little single-seat fighter designed around A. A. Mikulin's 1100-hp AM 35 liquid-cooled inline engine. The prototype

(*Continued on page 44*)

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Soviet Fighters

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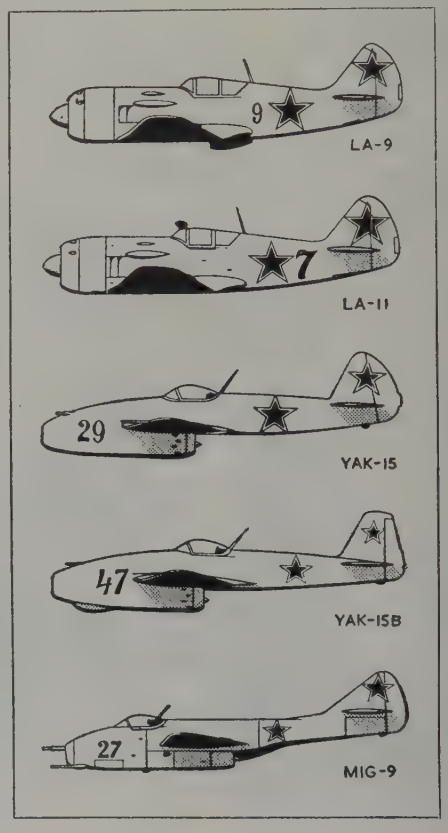
appeared late in 1937, was designated I-18 and a production contract awarded. Later, when the system of designating Soviet military airplanes was changed from functional letters to one copied from the Germans, whereby airplanes were associated with their designers and not directly with their role, the I-18 became known as the MiG-1. (Odd numbers being used for fighter-type airplanes and even numbers for other types of aircraft.)

The MiG-1 was a small, orthodox *Hurricane*-type fighter of composite construction carrying an armament of one 12.7-mm Beresin and two 7.62-mm Sh-KAS guns. Only a few MiG-1's were built before the more powerful 1,350-hp AM-35A engine became available, and with this powerplant and a few modifications such as a sliding canopy in place of the open cockpit of the earlier machine and a retractable tailwheel, the fighter became the MiG-3 (I-20), in which form it bore much of the brunt of the early fighting against the *Luftwaffe*. Its top speed was 341 mph and its range was 497 miles, but it was not very popular with its pilots because of its high landing speed and poor handling qualities. With the availability of other fighters, the MiG-3 was largely relegated to high-speed tactical reconnaissance duties; one of the Soviet aces, Guards-Colonel A. Pokryshkin discovered Von Kleist's *panzers* threatening Rostov-on-Don in 1941 while flying a MiG-3.

In the meantime, two other fighters, powered by Klimov's VK-103 and VK-105 liquid-cooled engines, had been placed in production. They were the direct results of a specification drawn up by the Soviet Air Staff in 1937. Various designers had submitted fighters to meet the performance requirements called for, some of which were awarded development contracts, but the I-19, designed by Semyon A. Lavochkin, assisted by designers Gorbunov and Gudkov, and the I-26, designed by Young Alexander Yakovlev, who had previously concentrated on light airplanes, were chosen for mass production. These fighters were later to be known as the LAGG-1 and TAK-1 respectively.

The first six months of the German *Blitzkreig* hit Soviet airplane production hard. The German invasion of Poland caused a rapid expansion, just as the shock of Pearl Harbor accelerated our own airplane industry, and when the German onslaught on Russia came, the output of the Soviet airplane industry had attained some 20,000 planes per year, of which almost half were fighters. However, the Russians made the near-fatal mistake of deploying too far forward, with the result that they lost a great proportion of their front-line aircraft, including much of the stored reserves. Some plants were overrun and most were threatened, so the decision was made to transfer a large proportion of the aircraft factories to the Urals and to Siberia. The decision was made early in the war, and while the plants were being moved, the fighting front had to manage as best it could, with obsolete aircraft and the few remaining reserves. The fighter elements were most hard hit. Had the German invasion come a year later, the *Luftwaffe* would have found the fighter regiments equipped with MiG-3, TAK-1 and LAGG-1 fighter monoplanes, but only a small proportion of the units had been re-equipped with MiG-3 fighters, and the YAK-1 and LAGG-1 squadrons were still training on their new mounts. Consequently, the bulk of the Soviet fighter pilots were flying I-15B and C biplanes and I-16B and C monoplanes of 1935-vintage. These were sitting ducks for German fighters and the carnage was terrible.

Anyone acquainted with the airplane industry will understand what a stupendous and nearly impossible task the Soviet decision to move its aircraft plants meant. However, tremendous drive was put behind the move and, at the beginning of 1942, the plants were again going concerns and production was on the increase. At the same time as the move was being made, production of new types was planned which, before more than two years passed, were pouring out like a river. Our own experience has taught us that it takes years to get a new type of military airplane into quantity production, yet the Russians managed to do it in much less time, although handicapped by the move of the plants.



Most of the fighter assembly plants had to move eastward, and most of the personnel, jigs and tools eventually arrived intact at Irkutsk, Semanova and Komsomolsk, and all were working to full capacity by the Spring of 1942. The Moscow, Kharkov, Taganrog and Leningrad plants building airframes, and the engine plants at Moscow, Voronezh and Zaporozshe, moved to Novosibirsk, Kazan, Konsomolsk and other towns in the East. By the end of 1941 Soviet airplane production had dropped to about 500 planes per month, and the plants unaffected by the move eastward could no longer replace battle wastage, but some of the gaps were filled by the first flow of British and U.S. fighter planes.

It was indeed fortunate for the Soviet Union that the German airplane industry had failed to expand appreciably in the previous year and, committed to a three-front air war, the *Luftwaffe* was in no position to take full advantage of Soviet airplane production predicaments. It was also fortunate that the German High Command underestimated the recuperative powers of the Soviet airplane industry.

By the summer of 1942, new fighter equipment was flowing into Soviet squadrons and front-line combat element were receiving large numbers of the LAGG-3 (I-22) and YAK-1 (I-26) fighters. The LAGG-3, which had followed the LAGG-1 on the assembly lines, was an extremely successful fighter and, according to *Luftwaffe* test pilots, was considerably superior in combat qualities to the MiG-3. On the other hand, Finnish pilots claimed that the LAGG-3 had poor acceleration and a tendency to spin in a sharp turn. However, the most outstanding feature of the LAGG-3 was its extremely robust wooden structure. The only metal used in its construction was in the control surface frames and the covering of the front fuselage.

Power was provided in initial production LAGG-3's, as in the LAGG-1, by a 990-1050-hp VK-103 engine, but later machines had the 1100-hp VK-105 which gave a top speed of 350 mph at 16,400 feet. Range and service ceiling were 400 miles and 29,500 feet respectively. Armament consisted of one 20-mm Sh-VAK cannon firing through the prop hub and two 12.7-mm Beresin machine guns mounted in the nose decking, an armament which, light by Western standards, was retained by most standard Soviet fighters throughout the war years. The only armor protection consisted of a 9-mm plate behind the pilot; no protection was provided underneath and, in the opinion of *Luftwaffe* pilots, the most vulnerable parts of the LAGG-3 were the coolant radiator and the wing tanks. Nevertheless, the LAGG-3 was highly successful in the hands of Soviet pilots and brought Semyon Lavochkin to the forefront in fighter design.

The YAK-1 began to enter service at the same time as the LAGG-3 and was similarly powered and armed. Designed by Alexander Yakovlev, who had previously spent some time in British, French, German and Italian airplane plants, the YAK-1 prototype, called *Krasavec* (*Beauty*) by the plant staff, won for Yakovlev the Order of Lenin, a ZIS automobile and 100,000 rubles. The YAK-1 was of composite construction; the wing consisting of light alloy spars, covered with a plywood skin, while the fuselage was of welded steel tube covered with plywood and, finally, with doped fabric. It proved to be a handy fighter, although the wing loading was quite high by Russian standards. It was simple to build and maintain, and gave quite a fair performance for low-altitude operations.

During the opening stages of the war, the Mikoyan-Gurevich team had been developing their extremely interesting MIG-5, the first Soviet twin-engine single-seat fighter since the I-9 of a decade earlier. The MIG-5 was of composite construction and powered by two 1100-hp VK-105 engines and carried an armament of two 20-mm Sh-VAK, two 7.62 Sh-KAS and one 12.7 mm Beresin guns. An interesting feature was the fitting of the 12.7

(*Continued on page 46*)

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Soviet Fighters

(*Continued from page 44*)

arranged to fire behind and below. Service ceiling was 40,000 feet but top sea-level speed was only 310 mph, and few MIG-5's entered service.

In April 1943, production of the LAGG-3 gave place to Lavochkin's neat little LA-5 which, like its predecessor, was of all-wood construction. It marked the return to favor of the radial motor for Soviet fighters, being powered by a 1,640-hp Ash-82F 14-cylinder radial in a close-fitting cowling, the engine exhaust stubs concentrated at the sides of the cowling following the vogue set by the German Fw-190A. The LA-5 was first used in large numbers in the Battle of Stalingrad where, from ground level to 12,000 feet, it proved to be aerobatically superior to the Fw-190 and Me-109F, and its success earned for Lavochkin the title of Hero of Socialist Labor.

Initial production models of the LA-5 used the same fuselage as the LAGG-3, but early in the fighter's career the fuselage was cut down aft of the pilot's cockpit to improve rearward view. Armament consisted of two 20-mm Sh-VAK cannon installed over the engine with 170 rounds of ammunition per gun, the best speeds ranged from 323 mph at sea level to 370 mph at 16,000 feet.

Taking advantage of the improved performance of later production versions of the ASh-82 radial, Lavochkin re-engined the LA-5 and produced the LA-7, acquiring a Stalin Prize of 100,000 rubles in the process. The two fighters were difficult to differentiate between, the only noticeable external changes being the repositioning of the intakes and radiator. The 1,850-hp ASh-82FNV radial increased low-altitude performance to 373 mph, and by the end of the war the LA-7 was in service in greater numbers than any other fighter type with the exception of the YAK-3.

Just as with the North American F-51 and Republic F-47 where we adopted a policy of improvement and development of basic designs, so did Yakovlev develop and improve his YAK-1, producing the YAK-1M (later YAK-3), the YAK-7B, the YAK-9 and the YAK-11 (later the YAK-9P, the designation of 'YAK-11' being allotted to a radial-engined advanced trainer using the same wings and empennage) fighters which were all cleaned-up and more powerful developments of the same basic design. Many thousands of fighters of this series were produced during World War II.

Actually, the YAK-7B and the YAK-9 were chronologically before the YAK-3, which did not become operational until 1944, both being interim developments while Klimov's new VK-107A of 1600 hp was being perfected for the YAK-3. The YAK-7B was, in actual fact, derived from a two-seat operational training version of the YAK-1, originally known as the UTI-26 and later as the YAK-7A. The YAK-7B was powered and armed like the YAK-1, but the rear fuselage was cut down to improve rearward view, the tailwheel was made retractable, and the carburetor air intake under the nose was redesigned and moved forward.

The YAK-9 was externally similar to the YAK-7B in most respects, and could be distinguished from the earlier machine only by means of its shallower air intake under the nose. The powerplant was the VK-105PF of 1,210 hp, calling for slight revision of the nose contours, and one version of the YAK-9 had its normal 20-mm Sh-VAK cannon replaced by a 37-mm OKB-19 tank-busting gun, designed by Suranov, and 35 rounds of ammunition for this gun were carried.

The YAK-3 was the final wartime cleaned-up version of Yakovlev's 1937 design, and the most important fighter of this series. It was designed to take advantage of the 1600-hp VK-107A, but development delays in this engine led to the installation in the majority of YAK-3's of the 1,210-hp VK-105PF, and few VK-107A-powered YAK-3's saw operational service. Structurally, the YAK-3 was similar to the preceding fighters in this series and could be distinguished from the YAK-7B and YAK-9 by its increased wing span and repositioned air intake which had been moved from under the nose to the wing leading-edge roots. The YAK-3 was a fast-climbing low-altitude interceptor. When fighting the Fw-190, it rarely climbed above 17,000 feet; low down, the YAK-3 could outturn the highly maneuverable Focke-Wulf fighter, and many a *Luftwaffe* pilot stalled and crashed when trying to follow the Russian machine in a tight turn. Pilots of the French *Normandie Escadrille*, at one time equipped with YAK-3's, claimed that it had a higher performance than the *Spitfire* Mark 5, was lighter on the ailerons and smoother and lighter to fly.

Thus, the war in Europe entered its closing stages with the bulk of Soviet fighter elements equipped with LA-5, LA-7, YAK-9 and YAK-3 fighters which, if not so technically advanced as their Western contemporaries, were suitable for mass production, easy maintenance under Eastern front conditions, and could be flown by poorly trained pilots. The Lavochkin fighters were of all-wood, but this large-scale use of wood in Russian airplanes was not due, as has so often been suggested, to the desire to obtain the lightest possible structure. On the contrary, wood is far from suitable for combat airplanes and is particulary uneconomical for heavily loaded fighters. But it must be remembered that the Russians were short of light alloys, and it was for this reason alone that wooden or, in Yakovlev's fighters, composite wood and steel-tube structures were so extensively developed.

Again, Russian fighters were simple to build and could be produced by plants employing a high percentage of relatively unskilled labor. Stressed skin construction would, of course, have been desirable, but demanded too high a standard of manufacture and maintenance. Nevertheless, a very fine finish was obtained on Russian fighters by the simple expedient of covering them with a thick layer of polish. This stood up to operational service remarkably well, and one never saw rivets sticking out of the wings of Russian fighters as was frequently the case with their metal-winged Western contemporaries.

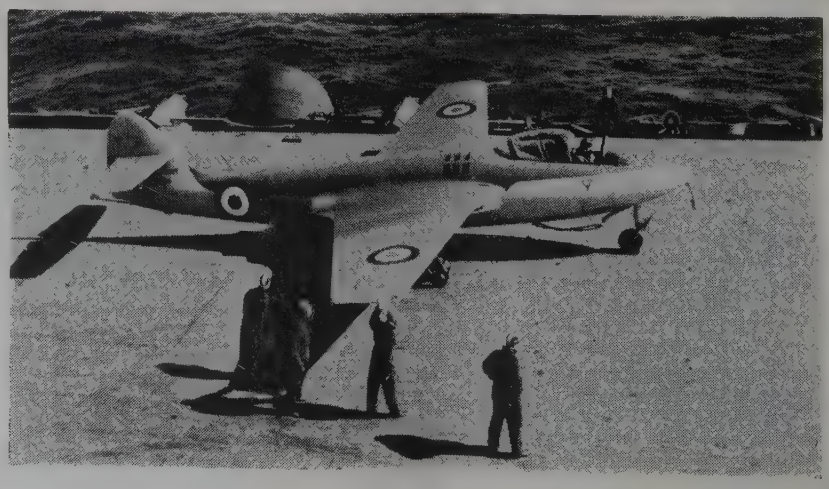
Fighter equipment was taken to the limits of austerity. The Russian ordnance was of a very high standard but normal fighter armament of one 20-mm Sh-VAK cannon and two 12.7-mm Beresin machine guns provided a low weight of fire by Western standards. Usually a total of approximately 1200 rounds of 20-mm ammunition and 440 rounds of 12.7-mm ammunition was carried. The Sh-VAK had a rate of fire of 700 to 800 rpm, and a muzzle velocity of 840 metres per second, which was similar to the Beresin gun. The gunsight was usually a rudimentary affair bearing some resemblance to the early British reflector types. The lens was about one and three quarters inches in diameter, and two deflection rings, one for 200 km/h, and the other for 300 km/h, were fitted, but with the lens sight the pilot could only see the outer ring by leaning towards the cockpit side, and no fine degree of deflection could be obtained, pilots firing full force and aft of the target in combat.

Instrumentation was extremely limited, no gyroscopic instruments being installed. Instrument flying had to be undertaken on primary instruments alone and compasses were of elementary type with frequently as much as a 30° error. The R/T sets were unreliable high-frequency units working on one channel and used mostly for air-to-air communications.

The end of World War II also saw the beginning of the end of the piston-engined fighter in Russia as it did in the West, but the closing stages had brought further developments in the fighter series produced by

(*Continued on page 48*)

SEA HAWK is the Royal Navy's newest carrier jet. Shown here on deck of *HMS Eagle*, it is undergoing proving trials. *Sea Hawk* carries 20-mm cannon



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TRAIN IN MIAMI -- AIR CAPITAL OF THE WORLD

Soviet Fighters

(*Continued from page 46*)

the top-line designers Yakovlev and Lavochkin which, although too late to participate in the final operations, remained in production for the Soviet air arm and the air forces of the satellite countries until well into 1948-49.

What was probably the last of Yakovlev's piston-engined fighter designs, certainly his last to be built in quantity, was the YAK-11 which appeared in 1945. Redesignated YAK-9P in its production version, this fighter was a direct development of the YAK-3 using the 1600-hp VK-107A. It retained the standard armament of one 20-mm and two 12.7-mm guns, but an effort had been made to improve upon instrumentation and navigational aids, and the flush perspex faring in the rear fuselage suggested the addition of a D/F loop.

With some improvement in the supply of light alloys, Semyon Lavochkin had switched from wood to all-metal construction for his fighters. Powered by a 1850-hp ASh-82FNV radial, his LA-9, developed concurrently with the YAK-9P, was the first Russian all-metal single-seat fighter to reach quantity production. It bore little resemblance to previous Lavochkin fighters and possessed a maximum level speed of approximately 400 mph. Further development of the type resulted in the LA-11, an example of which was crash-landed near Tullinge, in Sweden, in 1949.

The LA-11 differed from the LA-9 in having a shorter fuselage and a wing of increased span. The early fighter's belly intake was incorporated in the nose of the LA-11, and the machine denoted a change in Russian approach to fighter armament, its armament comprising three 20-mm Sh-VAK cannon mounted unsymmetrically above the engine, two to port and one to starboard. Although of 1946-47 vintage, the LA-11's top speed was limited by the power available from its engine (1,850-hp ASh-82FNV). The more powerful piston engines, such as the 2100-hp ASh-90 (a copy of the Wright R-3350 by Svetsov), and the 3,00-hp M-300 were required for heavy bombers and as the piston engine had been surpassed by the turbojet for fighters, Lavochkin, like his fellow fighter designers, discarded it for the greater promise of the turbojet.

Jet Fighters

The fact that Russian designers had not succeeded in perfecting any original turbojet-powered fighters by the end of the war should not be taken to indicate that the Soviet Union was unaware of what was going on in jet-propulsion development in the U.S., Britain and Germany. On the contrary, both the Zhukovski Air Engineering Academy and TsAGI (Central Aero-Hydrodynamics Institute) had been working on various forms of jet propulsion for more than a decade without any tangible results.

The Zhukovski Academy was working on a jet unit in 1936, and TsAGI aerodynamicists such as S. A. Cristianovich, M. V. Keldish, C. A. Chapligin, A. I. Nyekrasov and B. N. Yuryev had designed aircraft to use various forms of jet propulsion but, unfortunately for the Russians, these advanced machines progressed no further than the drawing boards owing to their inability to perfect an acceptable powerplant. Yuryev's project was of particular interest as it was a twin-jet

SOVIET FIGHTERS 1925–1950

Designation	Engines	Power HP (Total)	Span	Length	All-Up Weight Lbs	Speed	Armament
I-2B	1 M-5	400	35'5"	23'6"	3,416	149	2x7.62mm
I-L-400	1 M-5	400	—	—	—	—	—
I-3	1 M-17	550	36'4"	26'1"	3,968	174	2x7.62mm
I-4	1 M-22	480	37'3"	23'10"	2,888	183	2x7.62mm
DI-2	1 M-17	550	40'11"	26'10"	4,572	173	4x7.62mm
I-5	1 M-22	480	36'0"	22'10"	2,777	185	4x7.62mm
I-6	1 M-15	525	31'8"	21'10"	3,130	208	2x7.62mm
DI-3	1 M-17	550	37'10"	26'1"	4,033	167	3x7.62mm
I-7	1 M-17	550	—	—	—	211	4x7.62mm
I-9	2 M-22	960	—	—	—	232	2x7.62mm
I-10	1 M-25	750	—	—	—	223	—
I-11	1 AM-34	750	33'5"	24'0"	—	230	2x7.62mm
MI-13	2 M-58	1700	66'10"	40'10"	—	235	1x 25mm 4x7.62mm
I-13	I M-25	750	33'5"	22'2"	—	221	4x7.62mm
I-15	1 M-25	750	33'5"	22'2"	—	223	4x7.62mm
DI-6	1 M-62	850	35'5"	25'6"	4,298	227	6x7.62mm
I-15B	1 M-63	1000	33'5"	22'2"	—	238	4x7.62mm
I-15C	1 M-63	1000	33'5"	22'2"	—	242	4x7.62mm
I-16	1 M-85	750	30'5"	21'3"	—	240	4x7.62mm
I-16B	1 M-62	1000	30'5"	21'3"	—	285	4x7.62mm
I-16C	1 M-88B	1100	33'8"	22'6"	—	310	2x 20mm 2x7.62mm
1-17	1 VK-100	860	33'1"	24'3"	4,221	304	1x 20mm 4x7.62mm
MIG-1	1 AM-35	1100	37'4"	31'5"	6,216	310	1x12.7mm 2x7.62mm
MIG-3	1 AM-35A	1350	37'4"	31'5"	6,393	341	1x12.6mm 2x7.62mm
MIG-5	2 VK-105	2200	—	—	—	310	2x 20mm 2x7.62mm 1x12.7mm
LAGG-1	1 VK-103	1050	31'9"	29'5"	6,700	342	1x 20mm 2x7.62mm
LAGG-3	1 VK-105	1100	31'9"	29'5"	7,000	348	1x 20mm 2x7.62mm
LA-5	1 ASh-82F	1640	32'3"	28'5"	7,385	370	2x 20mm
LA-7	1 ASh-82FNV	1850	32'3"	28'5"	7,482	373	2x 20mm
LA-9	1 ASh-82FNV	1850	34'10"	30'0"	7,500*	400*	2x12.7mm 1x 20mm
LA-11	1 ASh-82FNV	1850	32'6"	28'5"	7,500*	420*	3x 20mm
YAK-1	1 VK-105P	1100	32'10"	27'10"	5,952	333	2x12.7mm 1x 20mm
YAK-3	1 VK-105PF	1210	31'0"	28'11"	4,848	343	1x 20mm 2x12.7mm
YAK-7B	1VK-105P	1100	32'10"	27'10"	5,952	329	1x 20mm 2x12.7mm
YAK-9	1 VK-105PF	1210	32'10"	27'10"	6,606	372	1x 20mm 2x12.7mm
YAK-9P	1 VK-107A	1600	32'2"	27'11"	6,800	370	1x 20mm 2x12.7mm
JET FIGHTERS		(Thrust)					
YAK-15	1 M-004	1960	30'0"	28'0"	—	505	1x 20mm 2x12.7mm
YAK-15B	1 M-004	2200	30'0"	28'0"	—	510	2x 20mm
MIG-9	2 M-004*	2200	34'0"	33'0"	—	590	1x 37mm 2x 20mm
MIG-15	1 —	6000*	33'0"	33'0"	12,500*	650*	3 cannon
LA-15	1 —	—	35'0"	30'0"	—	550*	2x 20mm
LA-17*	1 —	6000*	40'0"	37'0"	—	630	2x 20mm

*approximate

prone-pilot flying wing that anticipated the Northrop by a decade. In 1942, Engineer Duzkin developed a rocket powerplant at TsAGI which was installed in an experimental fighter designed by V. F. Bolhovitin. The prototype crashed on its first test flight in 1943, and its pilot, Captain G. Y. Bahchivandzi, was killed.

Little further progress had been made by the time the war in Europe was drawing to a close. The *Luftwaffe* was making widespread use of turbojet-powered fighters, the RAF's first jet-fighter squadron was being formed, and the USAF was testing jets. Of the combatants, only Russia had failed to produce jet engines of an acceptable production standard. This state of affairs was a sharp thorn in the side of the Soviet Air Staff. Even though jet fighters were unnecessary for her retention of aerial superiority in the East, Russia was looking further ahead than the end of World War II.

The Kremlin was unwilling to admit the failure of their technicians to design a practical turbojet and endeavored to disguise Russia's shortcomings in this field by circulating reports of Soviet-designed jet fighters, examples of which were claimed to have been used over Berlin in May 1945. A certain Hero of the Soviet Union, Lieutenant-General Savitskii's exploits in one such machine were widely publicized. However, if a Soviet airplane with a jet unit *was* tested over Berlin before the end of the war, we can be certain that the power unit was of German origin.

Immediately the first turbojet plants and test installations were over-run by the Russians in Eastern Germany, all completed units were seized and hastily transported back to Russia. The jigs and tooling for the manufacture of these jet units followed and the comparatively well-tried Junkers *Jumo* 004B, then giving 1,980 pounds thrust and appearing to possess the best possibilities for immediate development, was chosen for production in Soviet Russia. Engineers Chelomey and Petrov were placed in charge of further development. Simultaneously, top-line fighter designers were ordered to produce jet fighters powered by the newly acquired engines as quickly as possible.

Alexander Yakovlev decided that, rather than spend time in designing a completely new airframe, he would adapt the airframe of his piston-engined fighter series to take a *Jumo* 004B turbojet. The result was the YAK-15 which made its debut at Tushino in 1946. A year later, on 3 August 1947, a formation of three YAK-15's gave a display of high-speed aerobatics, much to the gratifications of the assembled Muscovites, and by the end of the year a number of fighter squadrons had been equipped with the new machines.

The YAK-15 was at that time the world's smallest production jet fighter, and it was comparable in performance to the *Meteor* F.3 and the *Vampire* F.1 fighters then equipping the RAF, if slower than the USAF's Lockheed F-80 and deficient in armor protection and armament. But it suffered a number of serious faults which could be traced directly to the haste in which the original "lash-up" was made. In order to use the rear fuselage, tail assembly and wings common to the YAK-7B, 9 and 3 fighters, the turbojet had to be underslung in the nose to exhaust under the rear fuselage. This feature was not only undersirable aerodynamically, it necessitated considerable trim changes with every variation of throttle setting. However, it had the advantage of providing a high degree of accessibility for the jet unit which was then cleared for only some 30 hours running time. Structurally, the first YAK-15's differed little from previous YAK fighters, but a concave steel plate was built into the lower rear fuselage to afford protection from the hot exhaust gases, and the retractable tailwheel was fitted with a metal shroud plate which retracted with the wheel. As the YAK-15 flew quite fast (top speed being about 505 mph), it was considered to be successful, although reports suggest that it was tricky to fly and would spin at the least provocation. The nose-up engine-revving approach for landing, combined with the indifferent view from the rear-placed cockpit, undoubtedly resulted in many nose-over landing accidents, and the design was re-hashed, a new version appearing in service at the beginning of 1948.

This fighter, referred to as the YAK-15B, although at times reported as the YAK-17, differed primarily in having a nosewheel landing gear and redesigned vertical tail surfaces. The main undercarriage leg attachment points were transferred from the front to the rear wing spar, and the nosewheel was housed in a bulged fairing formed by a pressed front panel attached to the leg, two clam-type doors and a rear fairing. Armament was changed to two 20-mm cannon.

(*Continued on page 50*)

Soviet Fighters

(*Continued from page 49*)

In the meantime, Artem I. Mikoyan and Mikhail A. Gurevich, assisted by Nikolai Matyuk, had been working on a low-level ground-attack fighter, the MiG-9, which appeared in the 1947 May Day fly-past over Tushino. The MiG-9 was a considerably heavier fighter than its contemporary, the YAK-15, and showed many signs of being less of a "rush job". Two turbojets were employed and these were said to be BMW 003's, but there is some evidence to support the view that they were actually *Jumo* 004's. The two jets were mounted side-by-side in the nose and exhausted under the wing trailing edge and past a channeled rear fuselage. All-metal construction was employed and armament comprised one 37-mm OKB-18 tank-busting cannon and two 12.7-mm Beresin or 20-mm Sh-VAK guns, all of which protruded well ahead of the nose. Performance was very good for its time, top speed being approximately 590 mph at sea level. That the Soviet Air Staff was pleased is evidenced by the award in 1947 to its design team—A Stalin Prize (First Class) of 150,000 rubles.

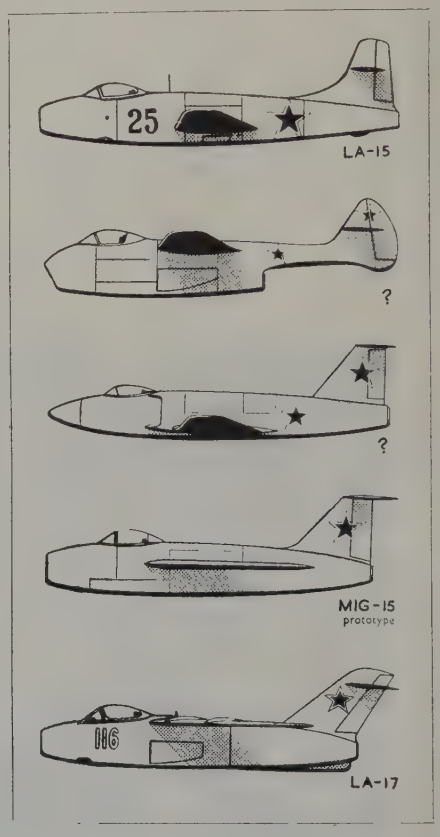
Lavochkin's first jet fighter, the LA-15, also appeared in 1947. This had a low mid-set wing and a long, slim fuselage on Western lines and reminiscent of the Republic F-84. However, as with various other fighters that appeared around that time, such as the small pod-and-boom fighter of uncertain parentage but often linked with the name of P. O. Sukhoi, the LA-15 did not offer sufficient performance improvement over existing jet fighters to warrant quantity production.

During 1946, a specification for a high-speed bomb-interceptor had been drawn up by Lieutenant General Savitskii, whose mythical exploits in a jet fighter of Russian design over Berlin have already been mentioned. The performance called for by the specification required a jet unit of at least twice the power given by units available at that time (the M-004 had been developed up to 2200 pounds thrust), but a derivative of the *Jumo* 004, with three extra compressor stages and a two-stage turbine, capable of 4400 pounds thrust was promised within a year, and the design of a fighter to meet the specification and using this turbojet was started.

Although there has been some argument as to the origin of this fighter, now well-known as the MiG-15, it seems fairly certain that it was the last product of the Mikoyan-Gurevich team before it split up, the designers now following separate lines of development. By the time the new fighter was in a fairly advanced stage of design, several examples of the early Rolls Royce *Nene* centrifugal-type turbojet were acquired from Britain, and as this was giving 4,850 pounds thrust (450 pound thrust more than that of the axial flow unit originally intended for installation) the fighter was re-worked to take the British engine.

The prototype was reportedly flown for the first time on 2 July 1947 and subsequently crashed. But a second prototype was built and flown soon afterwards. The prototypes differed from the eventual production MiG-15 in a number of respects. The production model had the T-type tailplane of the prototype lowered for structural reasons; the jet pipe length was reduced by cutting back under the tail to reduce thrust losses, and this, in turn, necessitated sharp sweepback on the vertical tail surfaces in order that the tailplane would be a sufficient distance from the wing.

Early in 1948 another sweptwing fighter completed its tests successfully, a design by Semyon Lavochkin reputedly designated LA-17. Larger than the MiG-15, the LA-17 was unusual in having its wing mounted in a shoulder position on the fuselage, presumably to avoid obstructing the lower fuselage with wing spars. Lavochkin's previous preoccupation with patrol and escort fighters (LA-9 and LA-11) suggests that the LA-17 may be suitable for longer range operations than the essentially short-range MiG-15, a theory that is strengthened by the fighter's external features—the shoulder-mounted wing, being free from all armament and wheel wells, is likely to accommodate wing tanks of considerable capacity.



The LA-17 bore a very strong family resemblance to the earlier LA-15, from which it would appear to have been developed, and prototype and production airplanes differed primarily in that the latter featured a dorsal fin running under the rear fuselage, and chordwise airflow fences on the wing upper surfaces. All members of the LA-17's landing gear folded into the fuselage—as did those of the LA-15—resulting in a very narrow undercarriage track. Armament comprised two 20-mm Sh-VAK cannon in the underside of the nose, but this may well have been increased on later production models.

The first production MiG-15's appeared before any deliveries were made of the LA-17 and the building up of squadron strength began in 1949. Production of this fighter was also started in Czechosolvakia under license early last year. In retrospect, it seems obvious that the 1946 specification that led to the MiG-15 was intended as an antidote to the threat of USAF strategic bombing, and operations in Korea suggest that it may have achieved just that aim. The armament of the MiG-15's met over Korea comprises one slow-firing large-caliber cannon—possibly a development of the 37-mm OKB-19—and two smaller guns, probably of 20-mm Sh-VAK type all mounted semi-externally under the nose. Initial production machines carried only two cannon, but the later production models which first appeared in Germany early last year were seen to carry an additional gun to port. They also featured vertical tail surfaces of lower aspect ratio and improved cockpit canopies.

The present armament of the MiG-15, although undoubtedly effective against slower flying bombers, leaves something to be desired in high-speed fighter-vs-fighter combat. The combat qualities of the MiG-15 are rated high by USAF pilots who consider it faster on the climb than the F-86 *Sabre* and more maneuverable at altitude, although inferior in range and dive speed.

The appearance of the MiG-15 and LA-17 fighters so soon after the end of the war can be partly attributed to the legacy of German research results and technicians obtained after the war, but primarily to the tremendous system of research facilities that have been built up over the past few years. These fighters marked Soviet attainment of world standard in this one important airplane category. They indicate that the Soviet Union has succeeded in solving many of the problems associated with the manufacture of all-metal high-speed aircraft and that the standard of workmanship in Russian plants is probably now on a level with that of the U. S. The equipment of modern Soviet fighters in contrast with the war years, when the fighter pilots' personal gear was stripped to the barest essentials, is now appreciably more comprehensive and such items as ejector seats are fitted as standard equipment.

We can rest assured that, in the period 1948-52, Soviet fighter designers have not been idle. Numerous new fighters from the drawing boards of all the top-line designers and from several newcomers to the field have appeared, and the Aviation Day fly-past over Tushino of 8 July, 1951 included four distinctly new types of jet fighters, both single and twin-engined.

Mikoyan, now working apart from Gurevich, has produced two new fighters that have been mentioned in the Russian Press, the MI-19 and MI-23, one of which is reportedly an advanced development of the MiG-15, and his erstwhile partner, Mikhail A. Gurevich is said to be responsible for a twin-jet all-weather and night fighter of semi-delta planform. Lovochkin's name has been linked with a new twin-jet all-weather fighter seen recently over Germany and featuring a 20° swept broadchord wing, T-type swept tail assembly, a crew of two seated in tandem and two axial-flow turbojets mounted at the fuselage sides in the style of the Avro Canada CF-100.

The reports concerning the design features of other current Soviet jet fighters are too conflicting to be included in this factual history of Soviet fighter development, but it probably won't be long before a fresh chapter can be added to the lineage of the Soviet fighter plane.

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Dilbert

(*Continued from page 38*)

foot out to push yourself along, and to regain your balance?

Best forget all about it. Accident reports indicate that not a few pilots have never outgrown their scooter days. A "Scooter Pilot" is one who flies marginal weather by getting down real close to the ground and dodging the hills right under the overcast. The results are not always happy.

Don't be a scooter pilot. Unless you are qualified to shift to an instrument flight plan and climb up through to an altitude that gives you a margin of safety, you'd better do a 180, but quick, and wait for better weather.

The one-foot-on-the-ground technique that worked so well on your scooter can get you into a lot of trouble in an airplane.

Wheel Warning—Dilbert waved goodbye to the boys on the line; said he was "going places and do things." He did!

His take-off was normal, but then he found he couldn't get the right wheel up in the locked position. After considerable jockeying around and by using the emergency system, he finally did manage to get both wheels down and locked.

Dilbert breathed a big sigh of relief and circled the field while he pondered his next move. "What should I do now? Try again and see if they won't come up this time?"

(No, Dilbert, perish the thought! If there is something the matter with your landing gear and you are fortunate enough to get it down and locked, for gosh sakes, leave it there! Go back and land, and have it drop-checked to locate the source of trouble. If you fool with it any more now, you will probably end up coming in on your belly or on one wheel.)

Of course, Dilbert couldn't hear this frantic warning, so he tried it again, and that's exactly how it ended—on his belly—to the tune of $1,863.00!

As one of the boys on the line succinctly remarked, "Well, maybe he didn't go places, but he sure did things."

Exhibitionism—A small percentage of pilots have the irresistible urge to show off. They just *must* impress their friends that they are hot stuff in an airplane. Of course, the best way to do this is to put on an exhibition at low altitude. All too often, they make their deepest impression when they hit, if you get what I mean.

Every pilot knows that the odds against him during flathatting are increased 100 to 1. Many things can go wrong and, when they do, reaction time is reduced almost to zero. Recovery from many emergencies at low altitude is physically impossible.

The following are a few of the things that can happen to low-down pilots, and did during a recent short period. Supply your own endings; they will usually be correct.

1. Plane collided with an unseen cable 60 feet above a bridge.
2. Plane collided with high tension wire strung across a ravine.
3. Plane collided with tree during unauthorized low-level flight.
4. Pilot dove on a swimming pool and probably blacked out in tight turn during attempted recovery.
5. Plane stalled out and crashed from tight turn at 300 feet while pilot was watching swimmers on beach.
6. While engaged in low-altitude aerobatics, pilot was unable to recover from an unusual position.
7. Pilot attempted to impress girl friend with a slow roll at extremely low altitude. When the plane reached the inverted position, the nose dropped and the plane dove into the ground.

Don't become a statistic
rather
the oldest living aviator

TV Towers—The construction of extremely high TV towers in many parts of the country presents an additional hazard for aviation. One such antenna which is being built in Pennsylvania will be 1,050 feet high. Since it is located on top of a hill, it will extend 2,530 feet above sea level. Many more will be erected in the future, and will not necessarily be located near metropolitan areas.

Pilots are urged to familiarize themselves with the location of these new towers by studying the *latest* aeronautical charts and publications for routes to be flown. Also check the Notams so you will get the word on any new construction which may not show even on the latest charts.

AUF Wiedersehn und Aloha—It will come as a surprise to many that Dilbert has been recalled to active duty in the Navy. Doubtless he is needed to show them how *not* to do it; there never was a better example. We are sorry to lose him—may our loss be their gain.

Anyone wishing to follow his boners as he flies combat aircraft in Naval Aviation, may do so by reading the Grampaw

Pettibone section of NAVAL AVIATION NEWS. This monthly publication can be obtained from The Superintendent of Documents, Government Printing Office, Washington, D. C., for the sum of $2 per year.

SETH'S SAFETY QUIZ

1. Why should you never use gasoline of a lower octane rating than that specified for your engine?

2. Dilbert taxied a mile and a half to take-off position using high rpm and heavy right brake. What happened immediately after take-off?

3. You are about to stall while landing a high-powered plane. To correct this, you slam on full power. What is apt to happen and why?

Safety Quiz Answers

1. Lower octane gas will cause pre-ignition, particularly at cruising powers and above. In severe cases, pre-ignition may cause complete engine destruction in a matter of seconds at full throttle operation.

2. The right brake froze. Yes, the subsequent groundloop was severe.

3. Barrel roll to the left due to propeller torque.

Air Intelligence

(*Continued from page 18*)

staggers in the air. The pilot leaves the dogfight. He heads out to sea trying to crash-land his ship in deep waters so the U. N. troops won't get hold of its secrets.

But just off shore is a British aircraft carrier. Alert crews spot the disabled MiG. Motorboats are launched. The minute the plane hits they head for the spot. Hours later salvage crews have raised the MiG wreckage. The plane hasn't been damaged too much. It is fairly intact; the first close-up glimpse of the MiG-15 anybody outside the Iron Curtain has seen!

Working together the British, American Navy and ATI men have secured a MiG. It is closely guarded. They ship it back to ATIC by air. It comes piecemeal—a wing panel, the other wing panel, the fuselage, the tail assembly. Parts come in from different points in the U.S. That's so nobody can learn just what's going on. Then, finally, it is assembled. Our pilots "wring it out" in special flight tests at a secret base.

It works like that—the ATI technique. Nobody knows the whole true story—or will tell it—of just how we got that first MiG-15. But the Defense Department announced its capture. The ATI people at Wright Field are very mum about it.

They admit, however, that they have a Russian jet. "It was badly shot up but some parts were intact," an officer explained. "The important thing is we had it only days after the machine was recovered."

My informant, an officer whose identity must be kept unknown because he is engaged in highly secret ATI global work, declared: "We know enough about the MiG-15 so that we could build one if we wanted to!"

One report is that we have two or more MiG's. They are reportedly being flown at the Air Proving Ground, Eglin Field, Fla. They aren't airplanes captured intact. But, rather, they are pieces of several MiG's taken from behind the enemy's lines, brought back here and put together to make flyable machines. That's a technique that was used during World War II with a Jap *Zero*, a Nazi *Junkers* and an Me-109. For a long time we didn't have one of these enemy planes. Then we began to get parts back from the fighting front. They were assembled and American pilots tried out the enemy planes against American planes in sham air duels. We learned a lot about performance that combat pilots couldn't tell us because they were too busy trying to stay alive to study technical performance details.

It was technical analysis by ATIC that supplied the information to General Hoyt Vandenberg, Air Chief of Staff, who later translated it into a warning to the American people that " in some phases the MiG is better than our *Sabre*." He had indisputable facts to back up the admonishment.

ATI reports of what they find, passed on to U.S. designers and engineers, enable corrections to be made in our planes, specific requirements designed to offset enemy advantages which have been uncovered. It could be, for instance, that we found a new kind of flap on a MiG wing which enables the plane to turn quicker, get out of the way of a *Sabre's* pass. That means we should have something better. Or, it could be the MiG's engine is superior, more power, better temperature control. That puts GE and Allison on the alert. What secret is it the Russians have? Find it? Get to work on it. Pronto.

It is impossible to pinpoint specific examples of things we have found in technical analysis of Russian-made equipment. That would be a breach of security. But we do know specific things. We are doing something about them.

"You can put that down as positive," the ATIC colonel emphasized.

He took me into a large storeroom (it used to be a museum) in a big warehouse building at WPAFB. The windows were blacked-out. There were somethings here which had big tents of canvas around them. Nobody got to even take a peak. There were also red-paneled doors bearing signs—"*Restricted Area. Keep Out.*" Here was the store of secrets.

"So you still insist we have a MiG-15 out here?" The Colonel laughed. "Well, we do have. And here it is!"

He opened one of the secret doors. There was a pile of junk—parts of a turbine engine, the cooling vanes, cowlings, wires, a seat, a tailpipe, a rudder fin, an elevator!

"If the pilot of that plane wrecked it in crash landing," he said, "you should see what we do to it here. That's what's left."

ATIC experts aren't half as interested in a complete airplane that will fly. They claim pilots in combat can bring home photographs from gun cameras that enable pretty accurate performance data to be determined. Data like how fast a MiG runs away; how sharp it turns; how steep it climbs. It doesn't take too much of a wizard to unscramble pictures. But ATIC wants to find out what makes the MiG or any allied piece of equipment tick. What it's made of. How it's made. How good it is. How long it will endure rough treatment. These highly technical bits of information are most valuable.

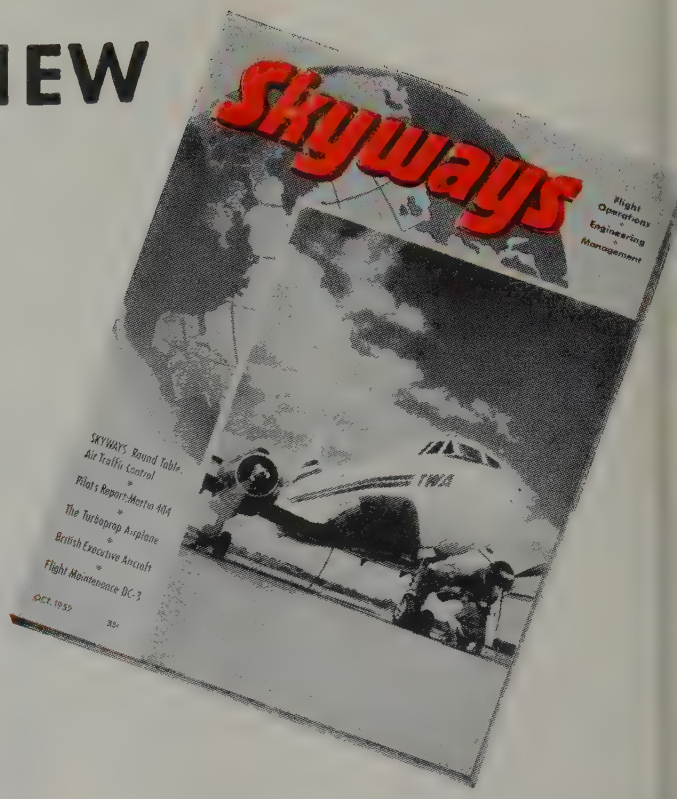
Literally, they put captured equipment under a scientific microscope. Some parts, a rudder fin or elevator, for instance, may get hours and hours of test runs in one of the field's five ever-running wind tunnels. Here, aerodynamicists can come up with the answers to many questions. Or, such a simple thing as the material used in a captured flying suit may get the third-degree in the Materiels Laboratory. It could be—as the Russians claim—they invented a new kind of nylon!

ATIC has anything and everything to work with. The storeroom is bulging with boxes of different equipment. In one corner is a rack of clothing; uniforms of navy, air, army officers. All North Korean. They show in fact and detail what the well-dressed pilot of a MiG is wearing, winter or summer. They don't look very spiffy.

But, as the officer pointed out, we can't afford to overlook any minute detail. A cut in the cloth, a new kind of seam indicating a small unusual pocket might be the clue to some kind of new piece of equipment that the Red flyers are carrying.

(*Continued on page 56*)

introducing **THE NEW**



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Typical Contents: October

Features in the October issue of Skyways will include:

- Executive Pilot's Report: Martin 4-0-4
- The Turboprop Airplane
- TV in Corporate Planes
- British Executive Aircraft
- Automatic Flight with F-5
- Maintenance of the DC-3
- Flight Operations Round Table: Air Traffic Control.

Round Table

The first Skyways' Flight Operations Round Table was on the subject of Air Traffic Control. Participants in this discussion were:

- Lt. Col. S. T. Bettinger, Deputy Chief Pilot, Military Air Transport Service;
- Murray Block, Airways Operations Specialist, Civil Aeronautics Administration;
- Herbert Fisher, Exec. Dir. CAOA;
- Alfred B. Bennett, Taylorcraft, Inc.;
- Paul Husak, Sr. Flight Dispatch Coordinator, Trans-World Airline, Atlantic Region;
- David S. Little, Ass't Director, Flight, American Airlines;
- Cole H. Morrow, Chairman of Board, CAOA;
- William Parenteau, Airways Operations Specialist, CAA;
- Howard Pember, First Pilot, Texas Co.;
- Sam Saint, Director, ANTC Div., ATA;
- Capt. A. L. Ueltschi, Pres. Flight Safety, Inc.;
- Norman R. Smith, Radar Coordinator, CAA;
- Ralph Byrnes, Airways Ops. Specialist, CAA;
- Jerome Lederer, President of Flight Safety Foundation, was the moderator.

Coming up—November Issue

Plans for the November issue of the new Skyways feature:

- Executive Pilot's Report: Aero *Commander*
- Operation of DC-3 with Turbojet Boost; and many other flight operations articles.

Round Table: November

The November Flight Operations Round Table is being held in Los Angeles, California. The subject: Problems to be Considered in Turboprop-Turbojet Air Transport Operations. Participants will include engineering executives of the major airlines, aircraft, engine manufacturers, and high-ranking officers of Military Air Transport Service.

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Air Intelligence

(*Continued from page 53*)

In addition, on my specially escorted tour (so far as I know no other reporter has seen the house of secrets) I saw oxygen masks, gloves, flying jackets, boots, helmets, and other paraphernalia taken from the North Korean pilots. There were some crude combinations, but they seemed practical enough.

Separate from the equipment paraphernalia was a section where there were several Russian engines. What surprised me was that they were brand new; they hadn't even been taken from the crates yet. They were reciprocating engines used in Russian transport planes. I was told they were really American engines made in Russia under license!

Until recently, however, we hadn't been able to study them close to see if the Russians had made any "hidden" changes. It seems the stuff we gave the Russians in lend-lease is "secret" when we want to find out what happened to it. ATIC doesn't feel that way. It is going to find out anyway.

"How did we get those engines?" I asked. "Damned, if I know," the Colonel replied. "Frankly, they just came from somewhere."

There was much more to be seen. In cubby-holes which resembled a USAF warehouse, there were rows upon rows of instruments—altimeters, gyros, compasses, autopilots, gun-sights, airspeed indicators. Nobody could guess how many Red planes shot down by our flyer had contributed to the collection. But the instruments, many of them, were of the very latest type. Markings were in Russian!

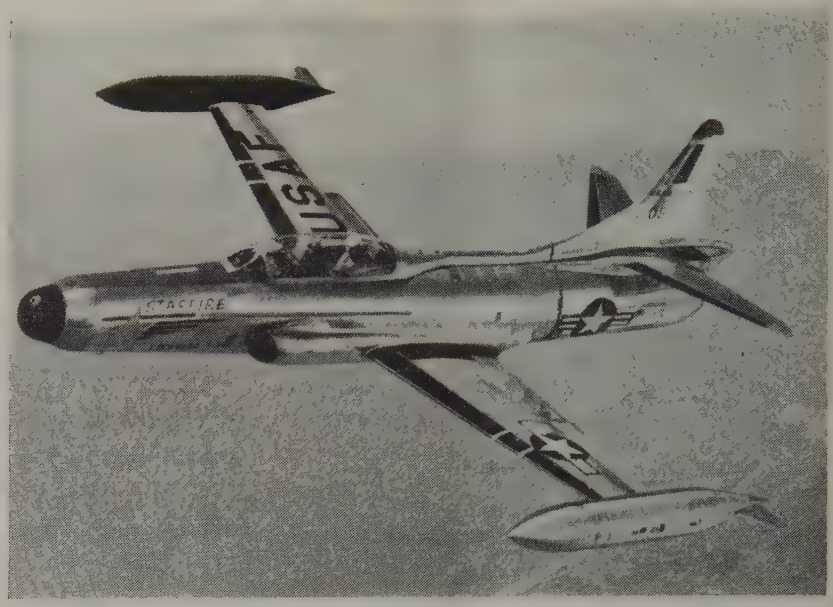
You could get a pretty good idea (with the help of a Russian translator) of just how fast a Russian plane could fly. The instruments indicating airspeeds were red-lined—maximum speeds without danger of tearing the machine apart. Even a layman couldn't miss the import of that. But the ATI boys could turn it into an airplane performance biography; very authentic.

I also saw some machine guns taken from shotdown MiG's. They are larger and heavier caliber than the guns in our F-86's. Caliber approached 20-mm. They have tested these guns on the firing range. They pack a lot of death wallop. But they don't have the rapid fire that the new .50-caliber guns on American *Sabres* possess.

In another corner of the warehouse, mechanics were unpacking complete wing panels which bore big red star insignia. It was a fairly intact piece of another Russian fighter. Other men were working on the assembly of a Russian IL-11 two-place plane. It was easy to see that the plane didn't have much range. The gas tank on the floor wasn't much bigger than an efficiency apartment refrigerator! They told me they would have the IL-11 flying in a couple of weeks.

Upstairs in the big concrete building that houses ATIC headquarters, there is virtually an engineering and draftsman shop like one you'd find in a plane factory. Here, engineers are busy night and day studying photos and recreating design features that come in from pilot reports and ARI on-the-spot observers. They are technically "reverse designing" some of Russia's best.

It goes on like this all the time. Today, Air Tech Intelligence is a big part of our defense. It is a home-front battle that never ends. The trouble is it is so secret that nobody can talk about its heroes.

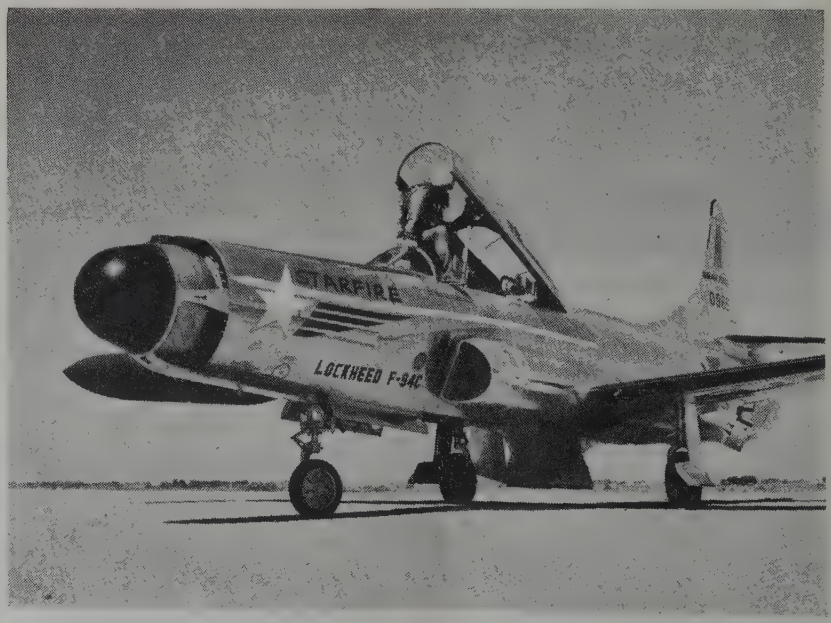


POWERPLANT of the F-94C is Pratt & Whitney J-48-P-5 producing 6,250 pounds thrust without afterburner. The afterburner adds extra power for extra combat performance

USAF's New Starfire

Air defense of the U.S. received a decided boost with the announcement of the delivery to the AF of the Lockheed F-94C *Starfire*. Some 1200 pounds of electronic equipment enables the F-94C to spot the enemy miles away, lock onto the target, track, close, aim and open fire, all automatically. The pilot and radar operator take the plane off the ground, maneuver to the general target area, switch on the "electronic crew" at the proper time, monitor operations during the attack, and then return to their base. The over-600-mph *Starfire* carries 24 air-to-air rockets housed in a ring of firing tubes around the nose. It can carry more rockets in new armament pods on the wings.

ROCKET DOORS are shown open here. In actual flight, rocket doors snap open only for instant during firing. Black hood on nose covers F-94C's radar apparatus



New York Approach

(*Continued from page 30*)

We inform the pilot when his approach is being monitored so he may listen to GCA advisory info on his ILS frequency if he desires," he stressed.

"What are the four positions you first mentioned?" we asked.

"Reading around the semi-circle, from left to right, is the New York Center position, Ground Control, Local or Tower Control, and Approach Control. They are self-explanatory except the New York Center position. The operator seated there is in direct contact with New York Airways Traffic Control. And on the Approach Control position, you will notice we utilize the mechanical interlock system which prevents Approach Control and Airways from attempting to use the same altitude at the same time!"

"Do you have any tips to pass along?" we asked. "Things pilots can do to help smooth out your job?"

"Nothing particularly vital," the controller replied. "Pilots occasionally forget to shift to Ground Control after clearing the runway. The most important item concerns the frequency to use inbound. When on a VFR clearance, our regulations call for making the *initial call-up* to Approach Control on 119.9 mc. Some pilots believe that since Approach Control is not involved at most airports except on IFR (instrument flight rules) clearances, the same rule prevails here. Therefore, they call LaGuardia Tower on the first contact. We are so occupied here, even in VFR weather, it expedites our handling of field traffic if Approach Control receives the first call. He can give and obtain essential field and wind information and then the Local Controller, or LaGuardia Tower as he is referred to by the pilots, need worry only about the landing clearance itself.

"Say a pilot calls in at Matawan," he explained, "and advises he is VFR. The Approach Controller can request him to change to the LaGuardia Tower at Flatbush or Maspeth and the frequency to use. The Approach Controller will hand the Local Controller a slip of paper listing the time, position and identification of the aircraft and the tower man will thereafter be expecting the aircraft's call and will be mentally preparing a place for it in the field pattern."

It is most enlightening and impressive to watch LaGuardia Tower personnel at work and it is a visit any pilot should enjoy. It certainly commands even greater respect for the men who perform this significant task. It makes one realize how much the pilots and the flying public depend on these men.

To understand what's involved, let's shift our scene to an inbound airliner, some three minutes west of Allentown, Pennsylvania, just about over the Slatington fan marker. Distance to New York: 113 miles.

Inside the cockpit, whether it be airline, private, or military, the pilots have unconsciously keyed themselves to a faster tempo. From now on in to the landing, they will have to be doubly alert, especially if they are arriving during a heavy traffic period.

This actual approach, picking up the speedy *Constellation* at Slatington, would be essentially the same for any aircraft. We will be directed to make contact with the New York Center at Allentown; sometimes it is Belle Mead or even New Brunswick (see RF 26A) on this particular airway (Green 3). It depends on how soon New York Center wants to begin direct contact with an approaching aircraft. Our instruction to change over to New York Center comes through our airline company (TWA) radio station at Harrisburg, Pennsylvania. Allentown Radio would transmit the change-over order to non-airline aircraft.

Our original clearance at Chicago was to LaGuardia Airport via Red 43 and Green 3, to maintain 13,000 feet. Over Slatington fan marker, Harrisburg calls;

"692 from Harrisburg. Clearance."

"Go ahead, Harrisburg. 692." We perk up.

"692 is cleared to change over to New York Center at Allentown. Center frequency 120.7 mc. New York weather station altimeter 30.10."

Allentown is crossed at 1910. We ring up Harrisburg to inform them we are changing over and give them our Allentown check and our New York estimate. We then call New York.

"New York Center, this is TWA 692 over Allentown at one-zero, 13,000 feet, on instruments. New Brunswick (next compulsory reporting point) twenty-two." We don't waste time and words by making a call up, since we can hear the Center and other aircraft on the frequency and know when the air is free.

The Center swiftly answers. "TWA 692, this is New York Center. You are cleared to Flatbush homing facility (sometimes they'll just say 'Flatbush'). Cross New Brunswick at 5,000 feet, maintain 5,000 feet, no delay expected (in case of radio failure, this NDE permits us to begin an approach from Flatbush, from 5,000 feet, upon our arrival there). Report leaving altitudes." We repeat the clearance back.

You don't advise Center, or regular Airways when leaving altitudes unless so requested. You are supposed to always advise Approach Control, automatically, when vacating altitudes.

As we near New Brunswick, 50 miles and a square turn from LaGuardia, we can hear the Center laddering an American DC-6 down behind us. Then, in the almost continuous transmission, our number pops out. "TWA 692 is cleared to cross New Brunswick descending, Matawan 3500 feet and maintain 3500 feet. Report passing New Brunswick. Change to LaGuardia Approach Control on 119.9 passing Matawan." We acknowledge:

"692 cross New Brunswick descending, Matawan 3500 feet, maintain 3500 feet, check New Brunswick."

In a few moments we are crossing the southwest leg of Newark and report. "692 over New Brunswick at 22, descending."

"Roger, 692."

(*Continued on page 60*)

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NAVIONS: 40 from $5500. 1949, 205hp. #479FKS, has 344 hours. Metal propeller. Auxiliary tank. Long stacks. Wheel fairings. Gyros. ADF. Latest improvements. Extras. Undamaged. Best condition. $9550. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City, "Airplanes Everywhere."

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New York Approach

(Continued from page 57)

We had been riding the southwest leg of Allentown until we started closing on New Brunswick. There we turned 30° to the right to be sure we would get astride the west leg of the Matawan VHF range prior to hitting the station. It is only 17 miles from point to point. As we slid over Matawan, we leaned her over in a 20° bank and rolled out on 40°. We were on the home stretch.

By now we have one ADF tuned to Flatbush, the other on LaGuardia and in the range position so we can ride the leg. Our ILS is quickly shifted from Matawan's channel "W" to LaGuardia's "Y". The marker switch is on low so we won't get interference between different markers. They are close together as you come in from the southwest.

"LaGuardia Approach Control, this is TWA 692, over Matawan at 26. 3500 feet." We feel like a horse heading for the barn after a day's work.

"TWA 692, cleared for a straight-in approach to the airport. (Advise leaving altitudes and passing Flatbush and Holmes.) Weather measured 700 feet, overcast, 3 miles, light rain, wind northwest 15-20. Runway 31. Altimeter 30.11. The time is 27 and one-half.")

"Roger. 692 cleared straight-in. Leaving 3500 feet."

"TWA, 692 left 3500 feet at 28."

Since we are number one to approach, or at least will be on reaching Flatbush, as indicated by our straight-in clearance, we push right on down to 1500 feet. This is the minimum enroute altitude between Matawan and Flatbush.

The ADF receiver on LaGuardia range is returned to Maspeth (ILS outer locator). Flaps are lowered to take-off, the greatest lift position, speed is reduced to 170 Indicated, and the field approach check list read.

"TWA 692, leaving Flatbush at 32, 1500 feet." We can see the glow of the millions of lights streaming beneath us.

"TWA 692, Roger. Report passing Maspeth and when contact."

The mike button is depressed for a quick "Roger, TWA 692." The gear is lowered and airspeed cut to 150. The final check list is completed and the ADF on Flatbush is tuned to Holmes, the ILS middle locator. As we start to intercept the glide path some 3 miles from the outer locator, approach flaps are called for. We coast down this electronic slope line at 130-140 mph, while the rate of descent hovers just under 500 feet per minute. We weave back and forth a bit in the bumpy air.

The ceiling grows ragged at 800 feet and at 600 feet we are well clear of the clouds. The approach lights on runway 4 beckon to us through the rain to tie down the location of the field. We notify the tower we are contact, make a 45° right turn, raise the flaps to take-off and in a couple of moments have 31 in sight. We widen our pattern at tower request to permit two aircraft to take off. In a few seconds we feel our tires making their first tentative grabs for terra firma.

As we wheel off the runway we flip over to Ground Control on 121.9. "TWA 692 on ground control," we declare.

"You are cleared to the gate, TWA, 692. Check the United DC-6 taxiing southwest.

The preceding approach could have been simpler and it could have been vastly more complicated, as the real thing often is. We might have faced a lot of holding, even as far out as Allentown. It depends on the weather and the traffic. It is no place for the novice and it demands keen alertness from the veteran. Study your procedures and charts before you try it.

NAVICOM

Common System at Midway Mark

C. F. Horne reports implementation of Common System progressing well

Implementation of the Common System—"aviation's big job today," according to CAA administrator C. F. Horne—is approaching the midway mark.

▶ The 438 programed VOR installations should be completed and commissioned this month.

The 180 ILS installations have passed the halfway mark with 70 more under construction.

Of 83 PAR's, 10 are commissioned and 43 more are in the set up stage.

Of 57 PAR's, 10 are complete with 13 more being readied for operation.

Of currently programed equipment, only DME stations and high intensity approach lights are in the just-starting stage. 20 terminals have lights and construction is underway at 12 more.

Remaining transition equipment, such as radar safety beacon equipment, is still in development or going through evaluation. Much needs to be done before these can move into the field.

This is a thumb-nail sketch of the briefing Mr. Horne gave recently to a group of electronic engineers at Dayton.

In bringing the engineers up to date, the administrator of civil aeronautics answered the following questions:

▶ *What is the Common System?*

"As the name implies, it is a system of air navigation and traffic control that will be used in *Common* by all *users* of the airspace. It is not the result of any unilateral action on the part of CAA. Far from it. The plans were not developed by the CAA alone, nor by just the government agencies interested in aviation. The plans were not presented to the aviation industry and to the military on a take-it-or-leave-it basis. On the contrary, they were forged by aviation itself, with each segment and special interest represented in the give and take of the conference table."

▶ *How did the system start?*

"Soon after the end of World War II, it became apparent that the low/medium frequency (L/MF) navigation system or four-course AN range and the existing systems of aeronautical communications and air traffic control were obsolescent and could not meet the future operational requirements of aviation. In 1947, the Radio Technical Commission for Aeronautics (RTCA) established Special Committee 31 to 'undertake a study of Air Traffic control for the purpose of developing recommendations for the safe control of expanding air traffic.' Government agencies, military and civil, trade associations, radio manufacturers, airlines and pilot groups were represented on Special Committee 31.

"Special Committee 31 found it had a most difficult task to perform. It seemed that every phase of aviation has special needs and requirements, and as a result each placed special emphasis on its own problems. Certainly, it is easy to understand that the problems of a small plane owner are very different from those of the Military Air Transport Service, and the requirements of a fighter pilot do not necessarily resemble those of a scheduled airline pilot. But SC-31 came up with some conclusions. The fact that has been accepted by Government and industry, and is currently used as a guide plan, is in itself a tribute to the spirit of cooperation and reasonableness which our democratic processes have developed so highly in the American people.

"The SC-31 report does not attempt to resolve the navigation and communications problems peculiar to tactical military operations, but it does provide for the navigational, air traffic control, and communications requirements of civil, military non-tactical air operations.

CAA Administrator C. F. Horne

"In January 1950, the Air Traffic Control and Navigation Panel of the Air Coordinating Committee (ACC/NAV Panel) established a special working group to review the SC-31 report and all other papers which dealt with the Common System.

"Special Working Group Five (SWG-5) was composed of representatives of the government, both military and civil, the Air Line Pilots Association, the Air Transport Association, the Airport Operators Council.

"The 'SWG-5 Report', as we call it, is a blueprint for the integration of air traffic operations within the United States. This report has added new impetus to the work which is underway, and new assurance to people who are planning for the future. Prepared as it was, by everyone concerned with aviation, the 'SWIG-5 Report' points up the fact that the Com- (*Continued on page* 62)

TRANSITION SYSTEM STATUS

Navigation Aid	Present Goal	In Commission	Under Construction
VOR	438	438	
ILS	180	98	70
HI Lites	*	20	12
DME	450	11#	
ASR	83	10	43
PAR	57	10	13

#—For evaluation only * —Not reported

Common System Now at Half-Way Mark

(*Continued from page 61*)

mon System concept is more necessary to us and more strongly endorsed by users than ever before.

"It is obvious that we will be denied the necessary time, in the case of an immediate declaration of war, to build a new and improved air transportation system within the United States. If war should come . . . it would have to be fought by using whatever air navigation and traffic control system is in operation at the moment. Because the establishment of the Common System represents a form of mutually agreed national defense insurance, it has the full and unqualified support of US military as well as civil interests."

▶*What are the benefits of the System?*

"The benefits of the Common System are of a rather tangible and specific nature. The benefits to the military forces can be measured by increased efficiency in air transport and supply. Its benefits to the airlines, for example, can be measured in substantially increasing passenger and cargo business. Its benefits to the private plane industry will be reflected, I believe, in increased use of small aircraft for business and pleasure.

"Its benefits to the taxpayer will be measured by the reduction in the cost of maintaining and operating multiple systems of air navigation and the ultimate reduction in the 'subsidy' payments made to scheduled air carriers."

▶*What's being done to put the system into use?*

"A Transition Program—a program that will raise aviation from its World War II status to the Common System plane—has been developed.

"Basically the transition program converts our navigation system to a system which provides the pilot with continuous information as to his position in space, utilizes radar as a terminal aid and traffic control facility in congested areas, provides direct communication between the pilot and the air route traffic controller and utilizes electronic and electro-mechanical techniques for the display and relay of information."

Cageable Vertical Gyro By Minneapolis-Honeywell

A new-type, rapid-caging gyro that allows practically unlimited maneuvering of aircraft without losing its vertical reference has been introduced by the Aeronautical Division of Minneapolis-Honeywell Regulator Company.

The company described it as being applicable to autopilot systems.

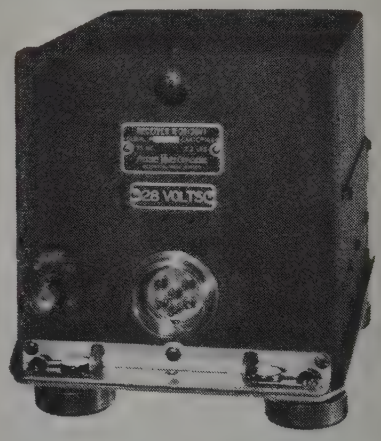
Called the cageable vertical gyro, the instrument features two-second caging time and a special tumbling pin construction that permits unlimited freedom of rotation about the outer gimbal axis and plus or minus 85° of rotation about its inner gimbal axis. The tumbling pin construction makes this freedom possible by causing the gyro to avoid the gimbal lock position.

New AIR-COMM 300A

VHF Transmitter for plane to control tower and range station, covering a radius up to 75 miles. The new AIR-COMM Transmitter Model 300A manufactured by the Air Communications Co., of Hackensack, N. J. is designed to be used with any low frequency radio receiver, providing inexpensive high quality 6-channel crystal-Controlled VHF communication, with a frequency stability of plus or minus .01 per cent. This compact transmitter weighs only 2½ lbs. and is furnished complete with power and antenna cables, antenna line in relays and complete installation data. It is plane tested and fully guaranteed.

Aircraft Radio Brings Out New R-20 Receiver

Aircraft Radio Corporation announces that its new R-20 Marker Beacon Receiver is now coming off the production line in Boonton, N. J. It weighs 2.6 pounds complete with shock mounting and is the result of a serious design attempt to maintain all required operating and environmental characteristics, yet to keep size, weight and complexity to a minimum.



R-20 MARKER BEACON receiver is now coming off assembly lines at Aircraft Radio Corp. The R-20 weighs just 2.6 pounds complete

The R-20 obtains its high voltage from one of the aircraft dynamotors capable of supplying 3 milliamperes at about 250 volts dc with no marker beacon signal, to 11 milliamperes for the duration of the marker signal.

The R-20 is CAA Type Certificated, 1R4-8. Capacitors and sensitive relays are sealed. Design and workmanship meet not only the requirements for CAA Type Certification, but all military operational specifications as well.

Repeated flight tests indicate freedom from TV, radar, and static interference. The Type R-20 Marker Beacon Receiver provides both aural and visual indication of 75-megacycle signals. Special effort has gone into the design to provide clean-cut keying of the visual blinker signal as well as a "clean" audio signal.

Receivers are currently available through ARC's nation-wide group of dealers and distributors.

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	18S Xmtr. Freq.	2110	2118	2126	2134	2142	2158	2166	2174	2182	2198	2206	2206	2350	2638	2670	2738	2782	4162.5	4402.5	4412.5	4422.5	4422.5	4457.5	6455	6660	8830	8840	8840	8820	11090	13210	13220	17610	17640
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NARCO Superhomer Recently Unveiled

A new version of NARCO's omnihomer was unveiled recently. The new unit features an improved noise-limiting circuit that will eliminate many of the noise-reducing headaches formerly involved at the time of installation of the old version. According to NARCO engineers, the increased cost of equipment will be more than offset in most cases by reduction in installation costs.

An additional improvement incorporated in the new model, which has logically been named the "Superhomer," is a vernier course-setting dial that permits settings to within 1° with little trouble.

The two new NARCO instruments (DME and Superhomer) will enable private pilots to establish accurate fixes quickly and accurately. To make a fix, the pilot simply takes a reading on the omni station and measures off on his chart the distance indicated by the DME, and there he is.

Also included in the $495 Superhomer is a four-channel VHF transmitter, receiver, left-right indicator with built-in To-From indication. J. F.

Lear LVTR-18 Ready For Executive Use

Anticipating the ever growing need for inexpensive two-way radio communication for executive-type aircraft, Lear, Inc. has made available what is believed to be the most practical combination radio transmitter-receiver system ever offered to the industry.

The Lear model LVTR-18 was first introduced as an 18-channel remote controlled 5-watt transmitter that had been initially developed by Lear to permit utilization of the additional frequencies within the range of 118.1 and 126.7 MC that were released jointly by the CAA and the FCC for use by executive and itinerant aircraft. The apparent need for a companion VHF receiver was met in this recent new development.

The LVTR-18 is now available as a completely self-contained, remotely operated, two-way communication system. It consists of three basic elements: a powerful 5-watt, 18-channel VHF transmitter, a rugged 18-channel VHF receiver, and an illuminated remote frequency selector switch that mounts on the instrument panel in the cockpit.

The VHF transmitter is capable of an output power in excess of 5 watts, 100 per cent modulated, with crisp, clear voice quality, unusual for a device of this type. It offers the added feature of providing a 7½ watt power amplifier for the cockpit speaker to boost the output level of aircraft receivers which normally have enough volume and power to operate headphones. When not being used as a transmitter, its modulator is available to function as a booster amplifier for the cockpit and cabin speakers. It also supplies a crystal calibrator check, enabling the pilot to pre-tune his external receiver to the crystal frequency upon which he is going to transmit. Thus, by simply pressing a button, he can tune his receiver to the same frequency he has selected on the transmitter. When working towers, this eliminates the necessity of asking for a long count from the tower while tuning him in.

The complete package is said to sell for about $795, without crystals and accessories.

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PLANE FAX

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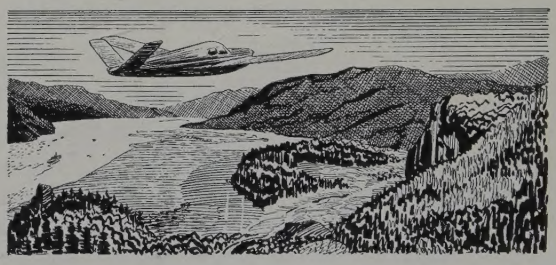
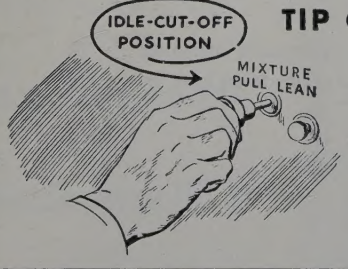
"Many private pilots like a definite spot to hangar when they land at a big airport. And that's where our small plane 'harbor,' right on the field, plays an important role. Important, too, to flying businessmen is flight economy. And that's where Chevron 80/87 Gasoline stars. Our experience shows that Chevron 80/87 is the all-round outstanding buy for small plane engines. Not only does it provide top take-off power, it eliminates detonation, and proves its economy in low cruising consumption. Most of our plane owners have switched to it!

"We're located at the mouth of the Columbia River water level route to the East—and pilots from all over the Northwest converge here to



fly this route—especially in winter when 'high weather' can be unpredictable. They're sold on RPM Aviation Oil, too. The reason's plain. 'RPM' has increased our overhaul period more than 20% over other top grade oils. And when we take our engines down, we find clean valves and amazingly low ring wear. Big points—because they mean better engine performance, longer life and dollars saved."

T.M.'S "RPM," "CHEVRON," REG. U.S. PAT. OFF.



TIP OF THE MONTH

Always use the idle-cut-off position of your mixture control to kill your engine. This cleans the fuel from the cylinders and reduces the chances of inadvertent starting if the prop is turned while the engine is hot or if the ignition has been left on.

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